ANATOMICAL STUDY OF FACIAL ARTERY PERFORATOR AND ITS CLINICAL APPLICATION IN ORAL SUBMUCOSAL FIBROSIS

Dissertation submitted in partial fulfilment of the requirements for the degree of

M.Ch. PLASTIC & RECONSTRUCTIVE SURGERY

BRANCH III

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CERTIFICATE

This is to certify that the dissertation entitled, "**ANATOMICAL STUDY OF FACIAL ARTERY PERFORATOR AND ITS CLINICAL APPLICATION IN ORAL SUBMUCOSAL FIBROSIS"** Submitted by **DR. K.SHYAMNATH KRISHNA PANDIAN** in partial fulfilment of the requirements for the award of the degree of M.Ch in Plastic & Reconstructive Surgery by The Tamilnadu Dr.M.G.R. Medical University Chennai is a bonafide record of the work done by him in the Department of Plastic Reconstructive & Facio-Maxillary Surgery, Madras Medical College, Chennai, during the academic year 2010 to 2013.

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DECLARATION

I Dr. K. SHYAMNATH KRISHNA PANDIAN solemnly declare that the Dissertation titled **"ANATOMICAL STUDY OF FACIAL ARTERY PERFORATOR AND ITS CLINICAL APPLICATION IN ORAL SUBMUCOSAL FIBROSIS"** has been prepared by me in the Department of Plastic Reconstructive & Facio-Maxillary Surgery, Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai. This is submitted to The Tamil Nadu Dr.M.G.R. Medical University, Chennai, in partial fulfilment of the Requirements for the Examination to be held in AUGUST – 2013 for the award of M.Ch. Degree (Branch III) in Plastic & Reconstructive Surgery.

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Place:

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CONTENTS

INTRODUCTION

Oral submucosal fibrosis usually presents as fibrosis followed by stiffness in the buccal mucosa, soft palate and faucial pillars. Fibrotic bands become palpable which run vertically in the cheek region and circumferentially in the lips[1]. Gradually, these fibrotic bands lead to inability in opening the mouth. This leads to hypersensitive mucosa to food[2].

Oral sub mucosal fibrosis is precancerous[2] and is more prevalent in India and one third of patients progressed to squamous cell carcinoma[3]. Surgical management is indicated in moderate to severe cases with trismus and have developed irreversible mucosal damage[4].

Resection of tumours in the cheek areas will have functional as well as aesthetic problems which can cause a major challenge to the reconstructive surgeons[5].

The best donor areas available for coverage of defects after oral submucosal fibrosis excision are the cheek and forehead areas. This is because of factors like proximity to the defect, excellent colour match and the easy way of transfer to the recipient site. The donor area for the nasolabial flaps parallels the nasolabial fold and spans between the

inner canthus and lower border of mandible since skin is lax in this area[5].

Nasolabial flaps can be either superiorly based or inferiorly based[6]. For the reconstruction of nasal defects lower eyelid defects as well as cheek defects excluding the area at the cephalad region of nose, superiorly based nasolabial flaps gives good coverage. For the reconstruction of lip, commissural defects or anterior part of oral cavity inferiorly based flaps are generally preferred[9]. Yet use of nasolabial flap is considered ideal for full thickness defect of nose with or without exposure of bone or cartilage[6].

Reconstruction of ala of nose by nasolabial flap utilises principle of local turn over flap[6].

Narrow flaps can be used to reconstruct small defects such as an alar rim deformity secondary to facial burn.

Columella reconstruction is often considered difficult since nasal flare duplication is highly difficult[7]. This can be easily achieved by tunnelling the superiorly based nasolabial flap on to the columella by an alar crease incision[6].

The nasolabial flap can be raised in many ways like superiorly based, inferiorly based, medially based or laterally based flaps because of the existence of the rich vascular network between the terminal branches of the facial artery[8].

These flaps also have a very rich subdermal vascular plexus making it possible to be raised both as a random pattern flap and an axial pattern flap or even as subcutaneous pedicled flap[9].

Bio geometry of raising these flaps is dictated by the presence redundant soft tissue availability in this region and in effect possibility to primarily close the secondary defect[9].

The maximum length of nasolabial flap that can be safely harvested is 10-12 cms[10]. Width is limited especially for superior and medially based flaps and maximum dimension is 5 cms only. Contrary to this, flaps based inferiorly have length limitations[10].

Tunnelling of flaps is generally easier for covering oral cavity defects without pedicle compromise. The greatest amount of restriction to tunnelling will be experienced for covering nasal defects when tunnelled between the inner canthus and nasolabial fold because of the least redundancy of tissue available in the region[11].

The factors determining the choice of pedicle orientation of the flap are the following

1. Location of the defect
2. Amount of rotation advancement movement.

The thickness of the flap also varies depending upon the receipient site needs and donor tissue composition. By this means the flap can be as thin as inclusion of subdermal plexus alone or to as thick as inclusion of skin down to the facial musculature can be raised according to the needs[12].

Although various flaps of different composition can be designed from facial artery, we applied the knowledge gained in cadaveric dissection of facial artery perforator for 2 clinical applications only because for the reasons mentioned below.

1. We found out in the departmental record analysis that the patient with oral submucosal fibrosis with restricted mouth opening reconstructed with buccal fat pad graft is associated with 80% recurrence rate.
2. On analysis we found that when buccal pad graft is used it does not reach the anterior half of the raw area created due to fibrotic band release.

3. From the cadaveric dissection we found out that there are constant perforators in the perforator triangle. The dominant of these to be included with the flap.

   So considering above facts we wanted to conduct this clinical application study where in the nasolabial flap is harvested on its cutaneous perforator from facial artery and propelled into the oral cavity to reliably cover the raw area created by releasing the fibrotic bands of submucosal fibrosis. To study the long term result of this novel technique constituted the clinical application.

4. The principle of “Like tissue reconstruction” goes long way in preventing the recurrence of fibrosis. In patients with oral submucosal fibrosis TMJ can become ankylosed in long standing cases and needs evaluation.

Fibrous band release, Coronoidectomy and nasolabial flap inset to attain adequate mouth opening in few cases were done. It is a viable option and also studied in the clinical application in the suitable patients. Long term results are presented in this manuscript.

AIMS & OBJECTIVES

AIM:

To evaluate the applicability of nasolabial perforator flap in the surgical management of oral submucosal fibrosis

OBJECTIVES:

1. To define the anatomy of facial artery and its perforators
2. To design various flaps based on perforators and the branches of facial artery.
3. To study the variation in the anatomy of facial artery in South Indian subjects.
4. To correlate and apply the above knowledge obtained by cadaver dissection studies with clinical case studies.
5. To study the outcomes of these flaps to ascertain the usefulness of these flaps in planning reconstructive surgery.

SURGICAL ANATOMY

Gradual improvement in our understanding of the vascular basis of tissue transfers has occurred over the past century. Over the past two decades in particular, our understanding of the vascular anatomy of the integument of the human body has improved considerably.

Ian Taylor[13] re-evaluated the works of Karl Manchot[14] and Michel Salmon[15]. He has done extensive research with his team on the human vasculature and that work has led to our current appreciation of the human cutaneous vascular anatomy. Approximately 400 cutaneous perforators that form a network across the entire skin surface supply the integument. Choke anastomotic vessels whose calibre is reduced, connect individual perforators. This interconnection between various vascular territories or angiosomes should be utilised in designing skin flaps. The local perforator skin flap is an extension of this concept. An adequately vascularised flap can be created anywhere in the body based on an understanding of the underlying vascular anatomy and correct design and positioning of the flap with an artery and vein at its base.

The facial artery perforator flap is one such local perforator flap.

Koshima[16] in 1989 first gave detailed description of perforator flaps as a method of providing autologous reconstructive procedure with negligible morbidity to donor site. It is a method of dissecting around a single cutaneous perforator until its origin from the source vessel in deeper planes. It differs from traditional flap methods by producing minimal blood loss during harvest, exclusion of muscle and nerve from the flap and preservation of their function, ability to match the defect and its increased arc of rotation. This flap can be used free and pedicled flaps.

ANATOMY OF FACIAL ARTERY[17]:

The facial artery, one of the external carotid artery branches arise opposite to the occipital artery and superior to the greater horn of the hyoid bone. It is the principle artery to the skin of the facial region and has an average diameter of 2.1 mm at its origin.

The facial artery is the major arterial supply to the integument of the face through its branches. It also supplies the tonsils, submandibular gland, and many muscles of the facial region. It courses deep to the posterior belly of the digastric muscle and through the submandibular triangle, where the facial artery reaches the caudal border of the mandible and pierces the fascia over the masseter close

to its anterior border. At this point, it sends a submental artery branch to the neck. Also at this point, the facial muscle gives off a premasseteric branch, which ascends along the anterior border of the masseter to anastomose with the transverse facial artery superiorly.

The Superior and Inferior labial arteries arise from the main trunk of the facial artery near the angle of the mouth. Between the angle of the mouth and the medial canthus, the facial artery traverses superficial to, deep to, or through the levator labii superioris and the levator labii superioris alaque nasi muscles.

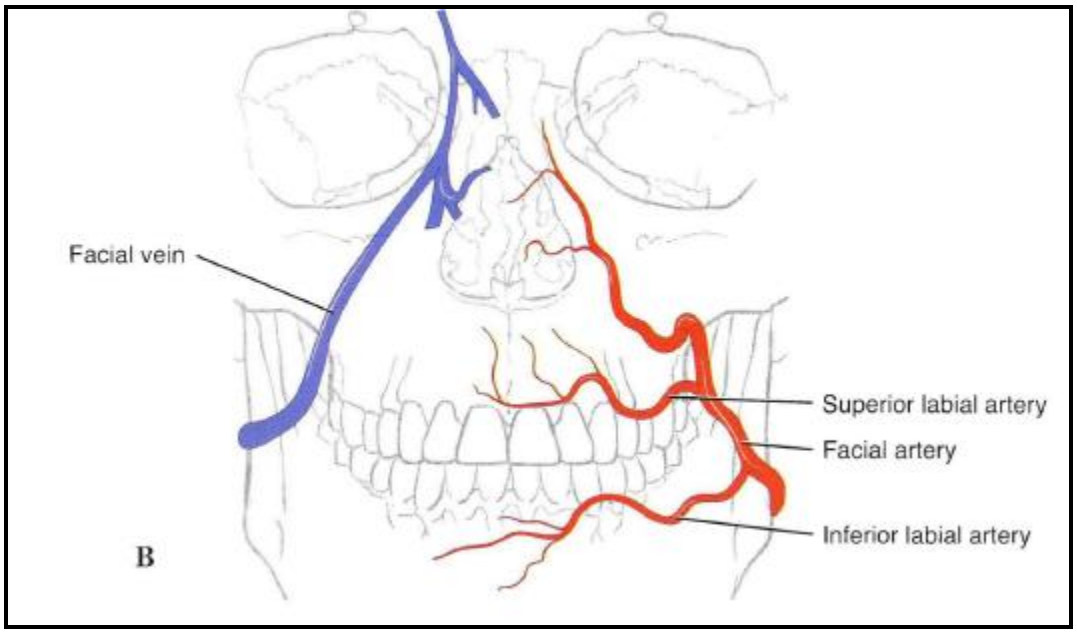


Figure 1: Course of Facial Artery in face

As the facial artery approaches the medial canthus, it becomes the angular artery and sends lateral nasal branches to the nose.

Finally, the angular artery anastomoses with multiple branches of the ophthalmic and infraorbital arteries.

The area supplied by the facial artery is 109.7 cm^2. The facial artery branches are the (1) submental, (2) premasseteric, (3) lateral nasal, (4) inferior
labial and (5) the superior labial arteries.

ANATOMIC BASIS OF FACIAL ARTERY PERFORATOR FLAPS [17,18]

Perforators can be either a direct cutaneous perforator which will arise from a source vessel and pass towards the skin to supply it or indirect cutaneous perforators that supply the deeper tissues before supplying the skin after its origin from the source vessel.

In the head and neck regions perforator flaps can be divided into

a) Direct cutaneous perforator flaps and
b) Indirect cutaneous perforator flaps.

The primary cutaneous supply is through direct cutaneous perforators.
Their main destination is the skin irrespective of whether they follow the intermuscular septa or pierce muscles. They are usually large and

spaced well apart from each other in the head and neck, especially in mobile skin areas.

The secondary cutaneous supply is through indirect cutaneous arteries. They are the terminal branches of arteries and emerge from the deep fascia after supplying the muscle. They reinforce and interconnect with the primary supply to the skin (musculocutaneous and fasciocutaneous perforators).

The head and face region is notable for its excellent blood supply; therefore many defects may be reconstructed with perforator island flaps.

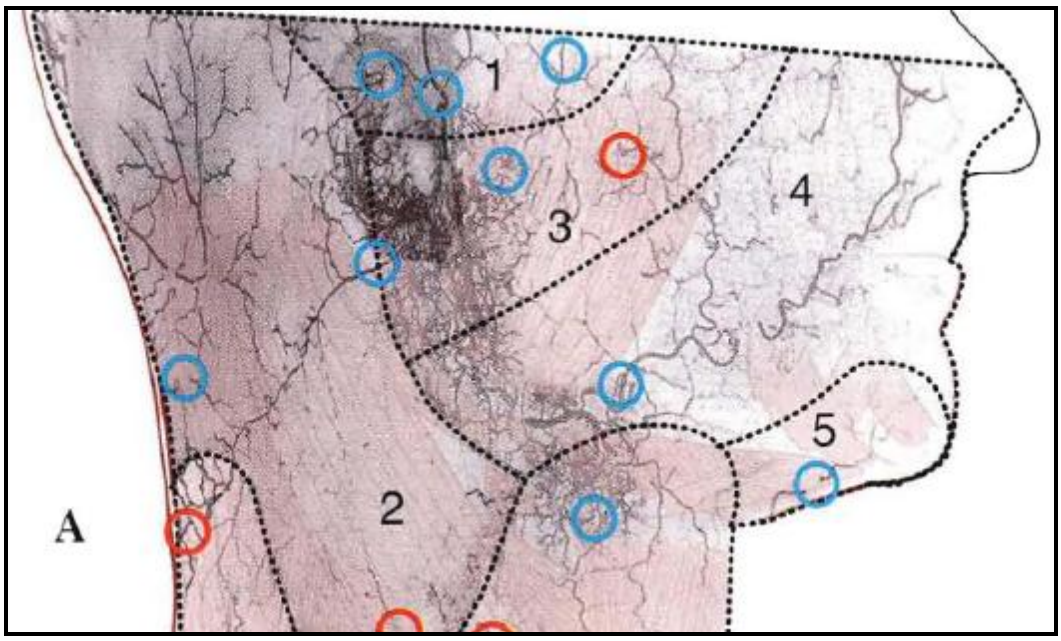


Figure 2 : Angiogram of integument showing the vascular territories, 1, Superficial temporal artery ; 2, occipital artery; 3, transverse facial artery ; 4, facial artery; 5, submental artery;

Direct Perforator Flaps[19]

Direct perforator flaps are based on vessels that directly supply the skin. Although modifications in detail are numerous, they all are variations of basic patterns supported by the facial artery.

Nasolabial Flap[20]

Nasolabial fold is the area of junction between the cheek and lip aesthetic units. Dimension of nasolabial flap are the superior limit extends upto the inner canthus, the inferior limit extends up to the caudal border of mandible particularly in elder individual. This area has supple skin devoid of hair except lower down in male patients. The donor area for the nasolabial flaps extends from the inner canthus to the inferior margin of the mandible, especially in old patients. This area is generally hairless except for the lower cheek in males and is considered and here the skin is lax. The Superficial musculoaponeurotic system fascia is a fan like fascia that envelops the face and provides a suspensory sheet. It connects to the facial musculature in the nasolabial, perioral, and periorbital regions.

The use of nasolabial flaps as traditional transposition flaps for repair of defects of the nose and cheek also has a long history which can be traced through several phases of evolution. In the first phase,

corresponding to the 19th century, the results of attempts to use these flaps in reconstruction of full thickness defects were compromised by failure to line the flaps with epithelium or by failure to provide adequate external cover when the flaps were used for vestibule lining[21]. Then in the early part of this century better methods of covering the reversed cheek flap were developed so that it could be used as a reliable source of vestibular lining in combination with either a cheek rotation or forehead flap.

Early versions utilised a long pedicled flap extended down into the cheek and folded on itself while the most modern techniques depend upon subcutaneously pedicled island flaps.

The region of cheek lying lateral to the alar base is involved in all these flaps and the blood supply to the skin of the nasolabial fold has three sources:

1. The lower part is supplied by direct branches of the facial artery,
2. The middle part is supplied by terminal branches of the infraorbital and transverse facial arteries, and
3. The uppermost part is supplied by branches from the angular artery.

In order to achieve sufficient mobility it has been found necessary to divide the perforators entering above the zygomaticus major but the posterolateral and inferior perforating groups of vessels are preserved. Where much migration of the flap is required it should be planned to reach as far as the lower border of the mandible otherwise the level of the angle of the mouth represents the minimum length[21]. When advancement above the level of alar base is planned the flap should generally not be advanced more than 2 cm since advancement more than this, was found by Hebert to impair the perfusion of the flap in majority of cases[25].

Nasolabial flaps may be based superiorly or inferiorly, or they may be subcutaneously pedicled island flaps. They must be based either on the cutaneous branches of the facial artery penetrating the subcutaneous tissues from below, or on the branches of the transverse facial artery entering from the lateral side.(Figure 4)

Indirect Perforator Flaps[19]

There are few true musculocutaneous flaps on the face because the skin is rarely supplied by perforators from the underlying muscles. Rather, the vessels on the face give off branches to muscles and separate branches to the skin. Flaps combining muscle and skin

around the mouth can be based on the superior and inferior labial arteries.

The superior labial artery most commonly will be seen in the musclomucosal plane deep to orbicularis oris and less commonly seen situated in the intramuscular plane within the orbicularis oris.

Similarly the inferior labial artery has sub mucosal course in 87% of cases and intra muscular course in 13% of cases.

The surface marking for superior labial artery is marked as a line parallel to the vermillion border of the upper lip 1 cm towards mucosal aspect and it has a tortuous course.

A variety of local lip flaps can be designed based on the vascular anatomy of the perioral arterial anatomy.

Harvest of the perforator flap is according to the angiosomes mapping guidelines by Taylor and Palmer.

Wei and Mardini [23, 24] performed free style perforator based procedure and introduced its concept in the year 2003. Yildrium advocated this sort of flap as the best procedure as it incorporated all the plastic surgical principles.

Like any other flap dissection this free style procedure also follows the same principles, the recipient defect dictates the donor site dimensions. First perforators are identified using Doppler[25] followed by designing, subsequently flap harvest on the appropriate donor area.

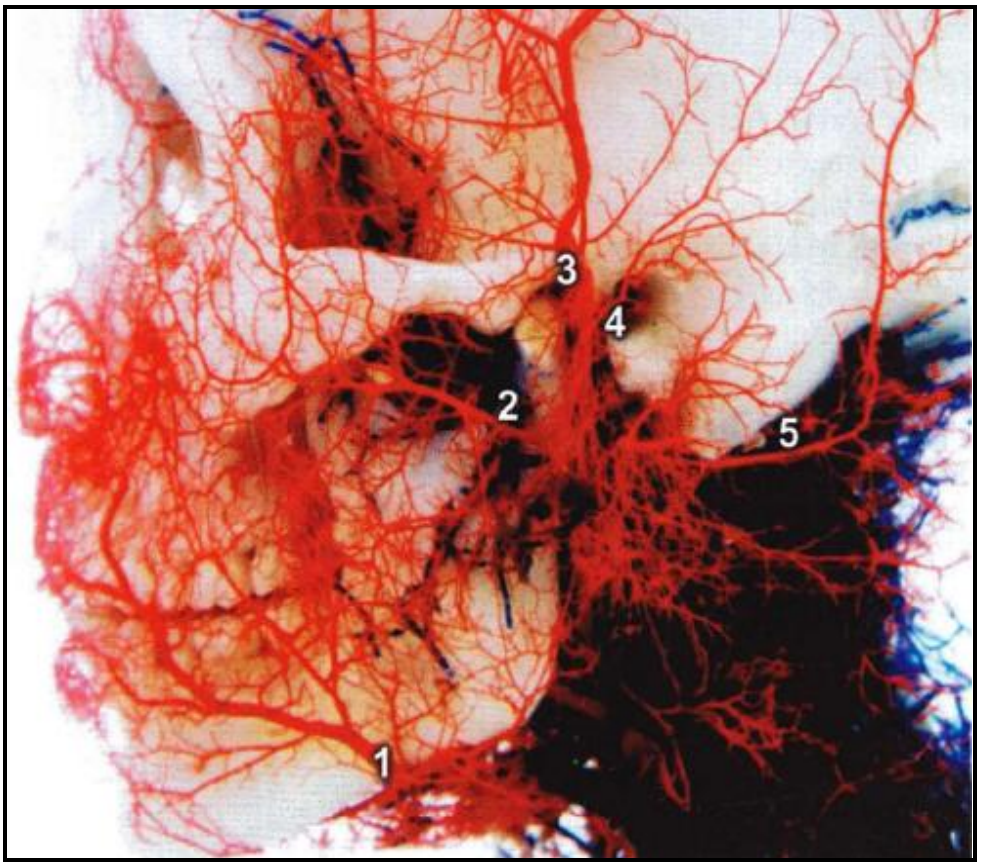


Figure 3: Arterial cast of head1.Facial artery 2.Transverse facial artery 3.Superficial temporal artery 4.Anterior auricular artery 5.Posterior auricular artery

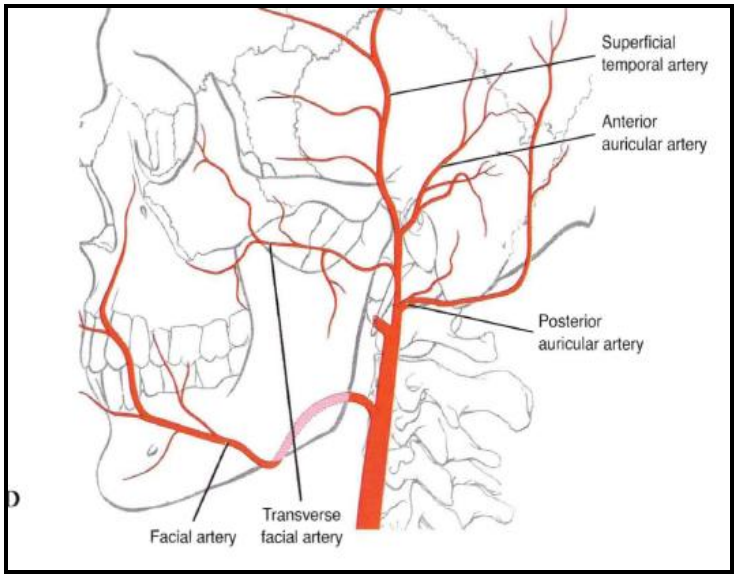


Figure 4: Branches of external carotid artery

The number of perforators to be preserved while dissecting the flap is decided based on requirement of flap size, arc of rotation and quality of Doppler signal.

After making the flap incision the initial part of dissection is carried out in the suprafacial plane above the muscle. As soon as the perforator vessel is identified dissection then proceeds in the sub facial plane around the perforator. Throughout the dissection flap vascularity is monitored continuously. When the dissection is completed flap is rotated to the defect on its pedicle and care is taken to avoid any stretching, kinking of the pedicle. Whenever there is tension on flap inset, mobilisation of the pedicle is carefully done to achieve adequate length of the pedicle.

Pedicled perforator flaps offer limited range of movement compared to free perforator flaps and it depends upon the elasticity of the tissue and the length of the perforator[19].

Maximum range of movement of a pedicled perforator flap is possible only when the flap is harvested on a single perforator. Here the maximum rotation movement achieved is upto 180 degrees. This way it can be called a propeller flap. Rotation can be either in the clockwise or anticlockwise direction.

When more than one perforator supplies the flap, a combination of rotation and advancement type of movement result. The range of movements is directly proportional to the number of perforators present. The amount of twisting of pedicle is indirectly proportional to the length of the pedicle, shorter the pedicle the more the twisting is.[19]

Free Style Local Perforator classification system of Flaps (FSLPF) was proposed by Francisco G. Bravo et al[19].

Type 1: (Single FSLPF)

Flaps that include single perforator can produce variety of movements as well as skin paddle design. They are of islanded design. These flaps have maximum range of movement.

Type 2: (Multi- FSLPF)

Flaps with two or more perforators can offer a limited arc of rotation and advancement movement as well as in designing the skin paddle. However the flaps can be raised as an islanded one.

Type 3: (Peninsular-FSLPF)

These are similar to the conventional fasciocutaneous or random pattern type of skin flaps in which the flap survival is maintained through multiple perforators entering its base. These flaps can be used either a transposition or an advancement flap. These flaps have a dual blood supply, but limited range of movement and design.

REVIEW OF LITERATURE

J. C. Paymaster et al[3] (1956): In his study from 1941 to 1947, author found 650 patients with carcinoma of buccal mucosa among a total of 3627 cases with intraoral malignancy. He found that cancer of tongue was most common followed by cancer of buccal mucosa. The predisposing factors evaluated were malnutrition with avitaminosis and betel nut chewing with tobacco Author observed pigmentation of the mucous membrane and localised submucous fibrosis affecting mainly soft palate, hard palate and tonsillar fossa. He observed that initial complaints were presence of burning sensation over the involved areas and irritation to spicy food. Oral submuccosal fibrosis can lead to Squamous cell carcinoma in about one third of cases.

Pindborg JJ, Sirsat SM[27] (1966): Authors defined the condition and were the first to divide oral submucous fibrosis depending only on histopathological features alone as advanced stage, moderately advanced, early stage and very early stage

Gewirtz H.S., Eilber F.R., Zarem H.A.[28] (1978): Employed nasolabial flaps in eight patients who had undergone wide local excision followed by simultaneous reconstruction. Three of the patients had presented with primary carcinoma, another three cases

with osteoradionecrosis, one case with failure of prior reconstruction and the other with both recurrent disease and osteoradionecrosis. All patients had good coverage of the defect and withstood further radiotherapy and adjuvant procedures. It is being said that Nasolabial flaps offer excellent double blood supply via the facial and ophthalmic vessels. Presence of minimal donor site morbidity and its ability to produce consistent results makes it a better choice.

Gupta D.S., Gupta M.K., Golhar B.L., et al.,[29] (1980): Reviewed the literature on oral submucosal fibrosis and classified oral submucosal fibrosis clinically into 4 stages with increasing intensity of trismus.

i. Very early stage: the patients complain of burning sensation of mouth or ulceration without difficulty in opening the mouth.
ii. Early stage: Along with symptoms of burning sensation patient complains of slight difficulty in opening the mouth.
iii. Moderately advanced stage: The trismus was marked to such an extent that patient cannot open his mouth more than 2 fingers width, therefore experiences difficulty in mastication.
iv. Advanced stage: Patient was undernourished, anaemic and had a marked degree of trismus and/or other symptoms as mentioned above.

They treated 15 patients by either microwave diathermy (MWD) alone or Vitamin A and Vitamin B complex tablets and Inj. Hydrocortisone or combination of both for comparative improvement and they found MWD to be of much value in early as well as moderately advanced stages of oral submucous fibrosis. In very advanced cases the use of microwave diathermy was very poor and without any satisfactory result. The author concluded that this therapy may be attempted in all the early stages and moderately advanced stages of oral submucous fibrosis.

Pindborg J.J.et al[30] (1980): In their study of incidence and early forms of OSMF in Ernakulam district of Kerala showed annual incidence of OSMF in 100,000 to be 13. It was found that all patients presented with OSMF chewed areca nut. Observation of 11 cases of OSMF had antecedent mucosal blanching. Mucosal blanching with or without other symptoms can be early signs of OSMF. Another predisposing factor include leukoplakia and lichen planus.

Daniel J.C. Yen[31] (1982): Did comparative study between surgical excision of fibrotic bands with Split thickness skin graft and surgical excision without skin graft. Study lasted for four years. In his study surgical excision alone cases showed recurrence of trismus

whereas cases with excision followed by skin grafting showed very good results in the form of improved mouth opening and a supple scar.

Murti P.R, Bhonsle R.B, Pindborg J.[32] (1985): 66 oral submucous fibrosis patients and followed it up for 17 years. This study confirmed the high malignant potential of submucous fibrosis. The rate of malignant transformation increased from 4.5% to 7.6 % after 2 years of extension of observation period. Most common age group with maximum incidence belong to 35 – 54 years of age.

They concluded that oral cancer developed in 5 patients. Malignant transformation in them was 4.5% over a period of 15 years of observation (average 8 years). This shows that Oral submucous fibrosis has high degree of carcinogenic potential.

Canniff J.P., Harvey W., Harris M.[33] (1986): Analysed 44 patients with OSMF and demonstrated genetic predisposition of the disease involving the Human leucocyte antigens a10, dr3, dr7 and probably b7 and the haplotypic pairs a10/dr3,b8/dr3 and a10/b8. All the cases were surgically treated by excising the existing fibrous tissue causing trismus and covering it with Therisch graft after completing coronoid excision and myotomy of temporalis muscles on both the sides. An inter-incisor opening of 35-40 mm was achieved in all the

cases and the patients were subjected to daily opening exercises and nocturnal props for further period of 4 weeks with good results. Based on immunological studies, they postulated that oral submucous fibrosis was an autoimmune disease due to the female preponderance, early onset of age, (mean thirty years), alteration in plasma immunoglobulin.

In vitro analysis study revealed that arecoline; one of the betel nut extracts showed stimulation of synthesis of collagen and proliferation of fibroblasts. Similarly the stabilisation of collagen fibres against degradation is done by tannin and catechin, the other betel nut extracts.

Tideman H., Bosanquet A. and Scott J.[34] (1986): Reported 3 cases where buccal pad of fat can be used as a pedicled graft that will cover the post excision defect in different carcinomas in head and neck region with satisfactory results. Even though the survival of the buccal pad of fat is not affected by the harmful effects of radiotherapy after surgery, in general these patients were asked to defer radiotherapy until complete epithelization of graft has taken place. It was advised that buccal fat pad should adequately cover the defect and should not be sutured under tension and patient should be on liquid diet until soft tissue healing to avoid postoperative complication like

infection and incomplete epithelization.

Glenn Morawetz, Nick Katsikeris, Simon Weinberg, et al[35] (1987): Authors reported two cases of oral submucous fibrosis. The diagnosis was confirmed histologically and both patients were treated by excising the bands of fibrous tissue and subsequent cover of raw area with split thickness skin graft. Immediate relief of trismus was observed in both cases which gradually increased with physiotherapy.

One patient had poor result in the form of difficult mouth opening however; this was due to incomplete physiotherapy. Surgery in the form of excision and grafting does not prevent the progression of oral submucous fibrosis, the authors have stressed on direct efforts towards maintaining maximal mouth opening and regular monitoring for development of cancer, since there is higher incidence of malignancy in such patients.

Kavarana N.M., Bhathena H.M.[36] (1987): In three patients having oral submucous fibrosis with severe trismus long term relief was successfully achieved by means of bilateral full thickness nasolabial flaps. Flaps sits into the raw area created after incising the oral mucosa. Favourable results were obtained by the author in the postoperative rehabilitative phase when the results were compared

with other methods. Hence this form of treatment was advocated for those cases of submucous fibrosis with severe trismus.

Gupta D., and Sharma S.C.[37] (1988): Reported the outcome of treatments of oral submucous fibrosis in 200 patients in whom twice weekly intralesional combination injection containing chymotrypsin, hyaluronidase and decadran administration for 10 weeks proved successful, except in 14 patients who presented with advanced form of the disease. They observed that maximum improvement using intralesional injections was obtained by the end of ten weeks, and found out that even after continuing the therapy on a monthly interval for additional year no further improvement was achieved. In another study group involving 14 patients who were unresponsive to this conservative therapy fresh human placental extracts were placed in the form of small pieces after surgical excision of the bands of fibrous tissue over the post excision raw area. This was followed by intralesional steroid injections twice in a week for four weeks. In this study group all the patients had early and very good relief of symptoms.

Hynes B., Boyd J.B.[38] (1988): Performed anatomic dissection on 12 cadaveric specimens and micro angiography on 6 others and confirmed that the facial artery passes deep to the facial mimetic

muscles and is not normally included within the flap. Although the vasculature of the flap is technically random the small vessels of the subdermal plexus are generally oriented along its long axis giving it a 'degree of axiality'. They quote two possible reasons for reliability of the flap.

1) Abundant dermo-subdermal plexus

2) Axial pattern of perfusion

This subcutaneous vascular network is supplied directly by the facial artery and transverse facial artery and indirectly by the anastomotic network between contralateral superior and inferior labial artery.

Pogrel et al.[39] (1998): gave detailed explanation regarding the complications of postoperative softening and elimination of nasolabial fold by investigating the anatomy of nasolabial fold through cadaver dissections. The nasolabial fold is absent in the newborn and deepens and becomes more prominent as age advances. The structures responsible for holding the buccal pad of fat and supporting it above the nasolabial fold, thereby forming the definition of nasolabial fold are appearing to be due to the combined effect of the arrangement of muscle fibres both across and parallel to the fold and the fibrous septae that support the fat pad.

This study gave a logical implication towards the development of newer surgical procedures in which elimination of the folds and softening was achieved by separating muscles from the dermis of the fold and allowing the fat to descend, making the fold to soften and disappear

Borle R.M., and Borle S.R.[40] (1991): Divided 326 patients into 2 groups - Group I had one hundred and sixty patients with ages ranging from 15-58 years. The group I further divided into A, B, C, D as per age[as the disease is more rapid in younger patients]. Group-I patients were given twice a week intralesional injections of triamcinolone in lidocaine 2% and hyaluronidase 1500 IU on a biweekly basis, for 4 weeks and followed on monthly basis. Group-II had 166 patients were given vitamin A chewable tablets 50,000 IU/O.D., oral ferrous fumarate 200mg/O.D. and topical beta-methasone drops (0.5mg/ml) / 6^{th} hourly / 3 weeks.

A follow-up for 1 year showed that Group-I patients experienced relief of symptoms in one week of treatment but without improvement in mouth opening. Reactivation was noted after 3-4 months. During the follow up, 14 patients developed infection.

In Group-II – In 2 weeks symptomatic relief was observed. Patients had improvement over buccal mucosa stiffness however there was no improvement in trismus. Relapse noticed after 4-6 months but they were less when compared to patients in group-I.

Thus it was concluded that conventional treatment with injections proved deleterious when compared to conservative treatment which was found to be safe however both modalities of treatment were palliative.

Pillai R et al.,[41] (1992): Stated that OSMF is multifactorial and appears in people who are genetically predisposed to have susceptibility to developing chronic inflammatory reaction over the oral cavity mucosa on exposure to the carcinogens like tobacco , arecholine , viralinfections etc.,

Samman N[42] (1993): Author in his retrospective evaluation of 29 patients with malignancies, benign tumors, oroantral fistulas, osteoradionecrosis and other defects received pedicled BFP grafts to reconstruct the acquired defects in the oral cavity. Of the total 29 cases, 28 healed well without complications. Healing of exposed BFP occurred within 2-3 weeks. Based on the results obtained in this series they concluded reconstruction of such defects in the oral cavity using

BFP is a wise consideration, hence the use of BFP is considered logical convenient as well as reliable method for reconstructing defects of upto 4 cms involving soft palate and posterior alveolar region of maxilla.

Khanna J.N., Andrade N.N.[43] (1995): Reported their experience with 100 cases of OSMF and found that areca nut was the primary cause of this entity. All lesions were biopsied and a clinico-histopathological staging was proposed. Very early & early stages were managed with conservative approach whereas advanced cases could be successfully treated with only surgical intervention. They described the technique of palatal island flap, a greater palatine artery based flap in combination with Coronoidectomy and temporalis myotomy. They achieved a mean opening of 35mm intra-operatively and on a follow-up of 4 years the average mouth opening ranged between 34-35mm. The donor areas healed well without any flap rejection or necrosis. The authors conclude that surgical treatment was the only solution in advanced cases and the technique of utilising palatal island flap was simple with promising results.

Lai D. R. et al.,[44] (1995): Conducted a retrospective study on a total of 150 patients diagnosed with different stages of OSMF who were managed by either medical or surgical treatment. Those patients

managed medically were grouped into A] oral vitamin B complex + bluflomedil hydrochloride + 0.1% topical triamcinolone B] Intralesional injection containing Decadran and Hyloronidase or C] A+B . In those who were managed surgically, fibrous tissue excision and covered with SSG or fresh human amnion or BFP were utilised.

Apart from these modalities the authors mention the use of bilateral full thickness nasolabial flaps in such cases but negate its use due to external facial scars, which was not acceptable by the patients. Surgical therapy led to improvement in trismus in cases with severe difficulty in mouth opening and hence it is considered as the treatment of choice in patients with advanced oral submucous fibrosis.

The author concluded that surgery, cessation of tobacco, postoperative oral physiotherapy are essential for successful management

Murti P.R., et al., (1995)[45]: Reviewed the role of arecanut chewing as a causative factor in OSMF and summarised that arecanut has a significant implication in the aetiology of oral submucous fibrosis.

Lai Yeh C.Y.[46] (1996): Presented use of buccal fat pad graft in the surgical management of oral submucous fibrosis. In his study, 9 patients underwent surgical release of fibrotic bands with or without

Coronoidectomy to achieve a minimal inter-incisor mouth opening of 35mm following which the defects were covered with pedicled buccal fat pads. The authors noted satisfactory results in all but two patients who failed to follow post-operative physiotherapy. They achieved an overall increase in the mouth opening by 1.9 cm over a mean follow up of 21.3 months. They noted that the technique was easy to perform and could be approached through the original incision. BFP also provided adequate bulk to cover the entire defect and epithelised by 2 to 3weeks with no incidence of breakdown or infection. They concluded that the technique was a reasonably acceptable for the management of oral submucous fibrosis.

Ducic Y., Burye M.[47] (2000) : Described the use of pedicled nasolabial flaps in oral cavity defect reconstruction with or without adjunctive micro vascular procedure. 28 flaps were used in eighteen patients, for reconstruction of various oral cavity defects. They showed good results in the form very high patient satisfaction score, significant improvement in overall functional outcome with no complication rate.

They arrived at the conclusion that inferiorly based nasolabial flaps can suitably cover moderate size defects of the oral cavity and when used in conjunction with micro vascular free tissue transfer

especially for large composite defects involving both tongue and floor of mouth. It can significantly improve speech and mastication.

Haider S.M., et al.,[48] (2000): Performed a study on 325 patients with from oral submucous fibrosis. The purpose of this study was to find the correlation between the fibrous bands and interincisor distance. They staged it clinically and functionally.

Clinical staging:

1) Faucial bands only
2) Faucial and buccal bands
3) Faucial and labial bands

Functional staging:

Stage A: Inter incisor distance- 13 – 20 mm

Stage B: Inter incisor distance - 10 – 12 mm

Stage C: Inter incisor distance - < 10 mm

They found that all those who had labial band also had buccal bands, all those who had buccal bands also had faucial bands but 111 (42%) of those with buccal bands did not have labial bands. They concluded that bands are common at the posterior region in mild cases of oral submucous fibrosis and as the disease increases in severity, are more likely to be found anteriorly as well.

MATERIAL AND METHODS

The study was conducted in the Department of Plastic & Reconstructive Surgery, Rajiv Gandhi Government General Hospital, and Madras Medical College over a period of 30 months from October 2010 to March 2013.

CADAVER DISSECTION STUDIES:

These were done in preserved cadavers in the Department of Anatomy, Madras Medical College. Prior permission and No objection certificate were obtained from the respective Heads of the department. The same were presented to the Institutional Ethical Committee and permission

obtained.

Procedure for Cadaver Dissection:

1. 28 facial artery specimens in 14 preserved cadavers were studied.
2. Dissection were performed with degloving approach to face, facial artery identified and dissected in ante grade manner and perforators identified
3. Callipers and scales were only used.
4. No injection study was done.

5. Perforators in relation to facial artery in the segment between upper and lower sulcus of mouth were defined.
6. Parameters assessed were:
    a. Number of perforators their size and location
    b. Presence/absence of venae commitantis

We observed the size of perforator is inversely proportional to the number of perforators in the perforator triangle.

We have examined the 28 facial artery cadaveric specimens there is constant perforator in the perforator triangle and it is bounded

- Cranially and Medially : Zygomaticus muscle
- Caudally and Inferiorly : Risorius muscle
- Posteriorly : Facial Vein

Two to three perforators in most of the specimens without any discernible accompanying vein found. In almost equal percentage they arise either from facial artery or its continuation angular artery or from the superior labial arteries.

Average number of perforators: 2.5

We applied these findings in our clinical study for harvesting Nasolabial flap for reconstruction of intra oral defects.

Figure 5 : Perforator arising from facial artery

Figure 6 : Perforator arising from superior labial artery

CLINICAL CASE STUDIES:

All cases of oral submucosal fibrosis with trismus that required surgical intervention were included in the study. The proforma for the collection of data is presented. All the relevant details of the patient during preoperative, surgical, and postoperative and follow up periods were collected and analyzed. Appropriate photographs were taken for documentation.

The patients were explained about the nature of the procedure and the various flap options available. The proposed procedure was explained to the patient in detail including its merits and demerits and informed written consent was obtained from the patient.

The proforma was submitted before the Institutional Ethical committee and approval obtained. The study did not incur any added expenditures for the patients or the department.

Inclusion Criteria:

- Patients with oral sub mucosal fibrosis leading to restricted mouth opening and intolerance to heat and spicy food.
- Patients who failed conservative management with inter incisor distance less than 2 cms

Exclusion Criteria:

- Submucosal fibrosis patients with adequate mouth opening
- Patients whose histopathological examination revealed malignancy and need more radical treatment.
- Patients not willing to quit arecanut chewing

SURGICAL TECHNIQUE

Preoperative preparation:

All co morbidities (including Type 2 DM) were attended to and appropriate consultations obtained to optimize the patient prior to surgery. Smokers were taken up for surgery after a two weeks period of complete cessation of smoking is ensured.

All patients were subjected to routine investigations for anaesthetic fitness.

Pre operative biopsy is done to rule out malignancy

Preoperatively OPG was done to rule out TMJ pathology

Hand held Doppler examination to identify & locate the perforators from facial artery prior to surgery or Angiogram or other invasive studies were not done in any of the patients since this is an Adhoc perforator

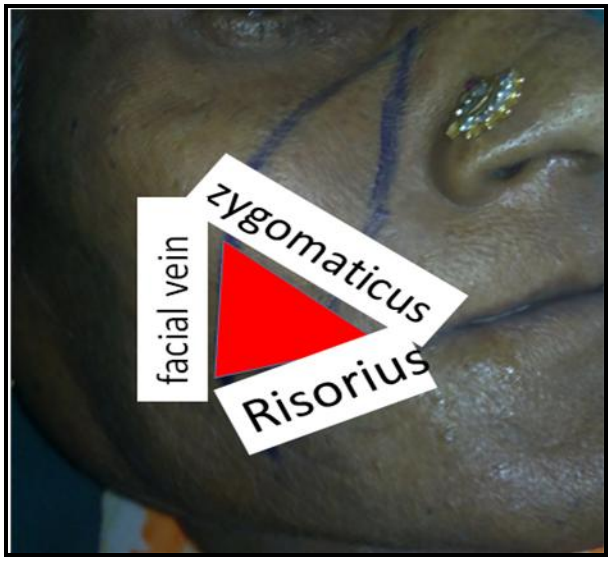


Figure 7: Perforator Triangle

OPERATIVE PROCEDURE FOR CLINICAL STUDIES

Anesthesia:

All patients were treated under general anesthesia through nasoendotracheal intubation using retrograde / blind nasal / fiber optic method.

All surgeries performed with 2.5X loupe magnification

Incision and fibrous bands release:

Intraoral bilateral infiltration was given along the planned incision line with 1:2, 00,000 epinephrine concentrations. Incisions were made using number 15 Bard Parker blade on each side of buccal mucosa at the level of occlusal plane away from Stenson's duct orifice. Incisions extended from the corner of the mouth anteriorly to the anterior pillar of fauces, soft palate and / or pterygomandibular raphe posteriorly depending on the extent of fibrous bands felt by palpation. Blunt dissection and undermining was done until no restrictions were felt.

Figure 8 : Armamentarium

Achievement of optimum mouth opening:

Using Fergusson's mouth gag, mouth was forcefully opened to an acceptable range of 40-45 mm. Out of these 40 patients, 22 patients in whom inter-incisor mouth opening of less than 30 mm was achieved by incising the fibrous bands, Coronoidectomy through same incision in vestibule to release the adoptive contracture of temporalis was done. Inter-incisor mouth opening of 40-45 mm was achieved for these patients. In other patients release of fibrous band alone resulted in adequate mouth opening. Haemostasis was achieved in all patients. Upper and lower third molars were extracted to facilitate access for Coronoidectomy and prevent entrapment of flap.

Reconstruction with nasolabial flap:

In these patients, after incising the fibrous bands and achieving acceptable range of mouth opening, bilateral elliptical shaped nasolabial flaps were marked with methylene blue ink. Flaps extended from the inner canthal region to the antero inferior border of the masseter along the mandible.

First the anterior incision is made, the dissection is performed towards the perforator triangle, perforators are identified which in 2 cases single perforator and in the remaining cases where multiple perforatoes are seen, single best perforator is identified by trial clamping of the perforators. Lignocaine is sprayed topically over the perforator to relieve vessel spasm and a good perfusion is seen at the extremes of nasolabial flap. After identifying the single best perforator the other perforators are divided and coagulated with bipolar cautery. In all clinical cases no obvious veins were seen, but studies have shown minuscule presence within the periperforator fatty cuff. The medial incision line followed the nasolabial folds till the inferior third and the width of the flap was kept 1.5-2 cm with medial and lateral limbs of the incision tapering at the ends. Bilaterally, flaps were raised in the plane of superficial musculoaponeurotic system from both ends

to the region of perforator triangle. The diameter of the pedicle was roughly 1.5-2 cm.

A transbuccal tunnel was created near the region of modiolus caudal to the sensory branch of Trigeminal nerve.. The flap was then transposed intraorally in tension free manner. The superior wing of the flap was sutured to the posterior edge of the defect while inferior wing was sutured to the anterior edge of the defect[21] or sometimes even it is inserted into the sulcus using 3-0 polyglecaprone suture material. Generous undermining of the donor site was done in the subcutaneous plane and layer wise closure done with 3-0 polyglactin suture for deeper layer and secondary defect closed primarily with 5-0 polypropylene suture.

Total operating time was approximately 3 hours.

Postoperative care and follow up:

All the patients received prophylactic antibiotic coverage 3 doses and liquid diet started on the evening of surgery. Extra-oral sutures were removed on the seventh post-operative day. Initial physiotherapy was started within 48 hours post operatively with mouth opening exercises and placing mouth prop inter-molarly. After tenth postoperative day, intense physiotherapy was started using Heister's mouth gag during day time and at bed time plastic mouth

prop is used. Duration and frequency were increased later to achieve the intraoperative values of mouth opening.

Patients were instructed and motivated to continue the physiotherapy themselves for 6 months and followed up. The inter-incisal mouth opening was recorded postoperatively with simple ruler and recorded in millimeters during follow up period.

CASE REPORT- NASOLABIAL FLAP

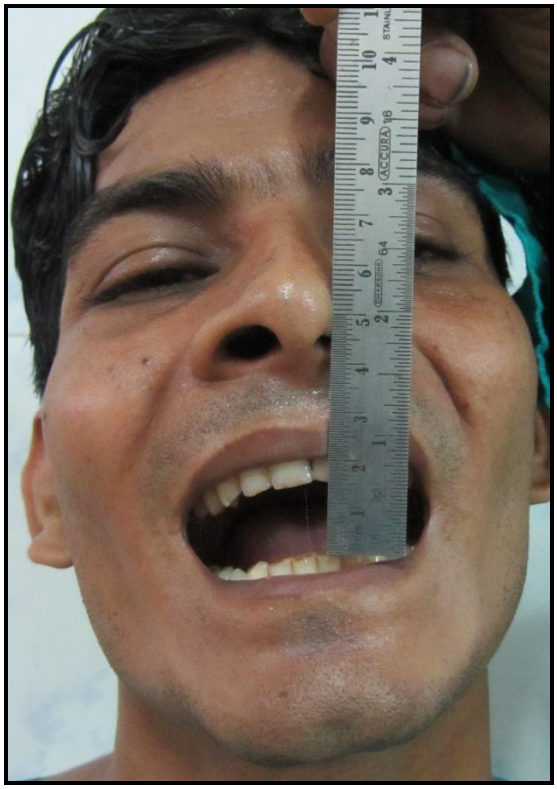


Figure 9 : Pre-operative photograph with decreased mouth opening

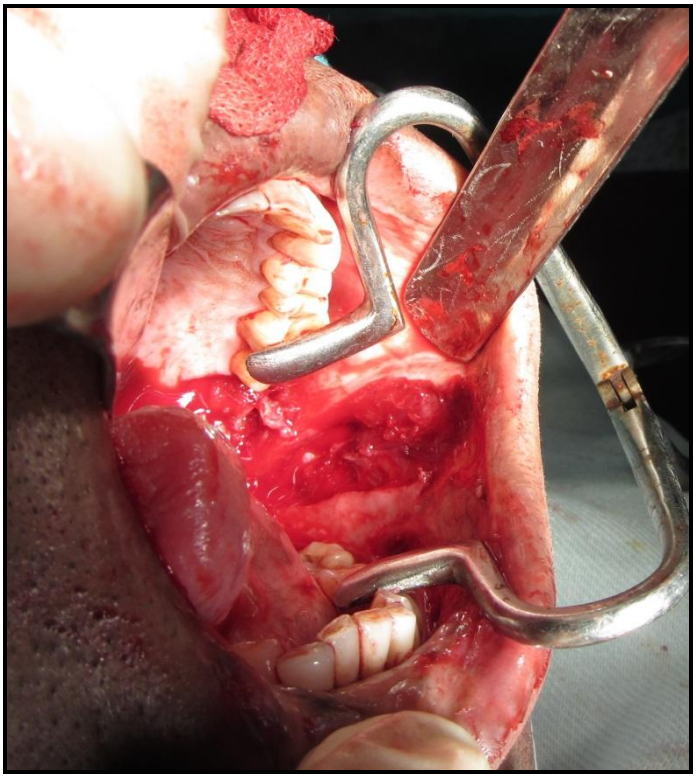


Figure 10: Incision and fibrous band release (left side)

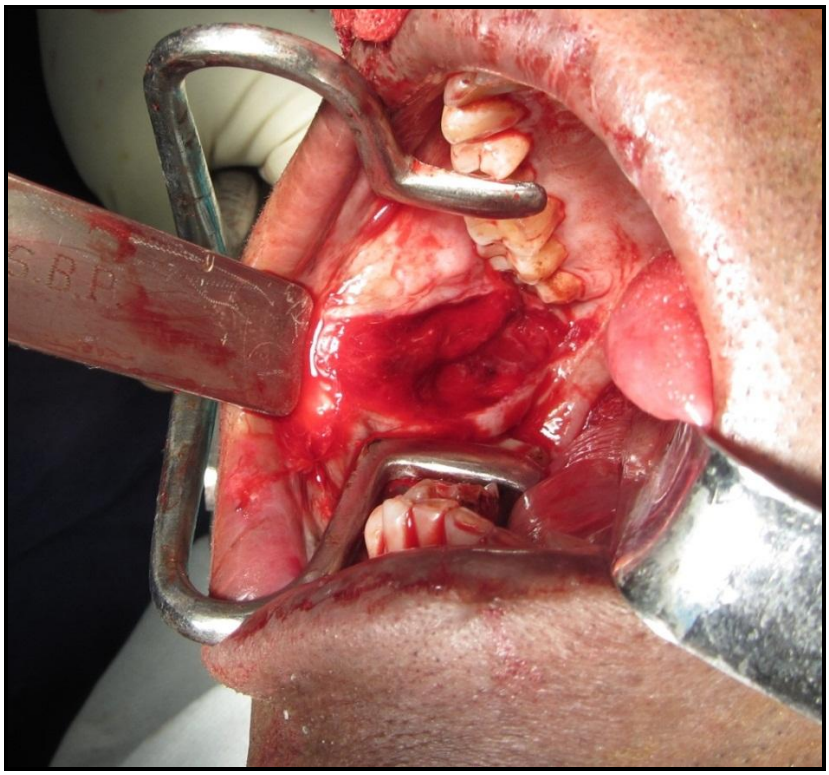


Figure 11 : Incision and fibrous band release (right side)

Figure 12 : Coronoidectomy specimen

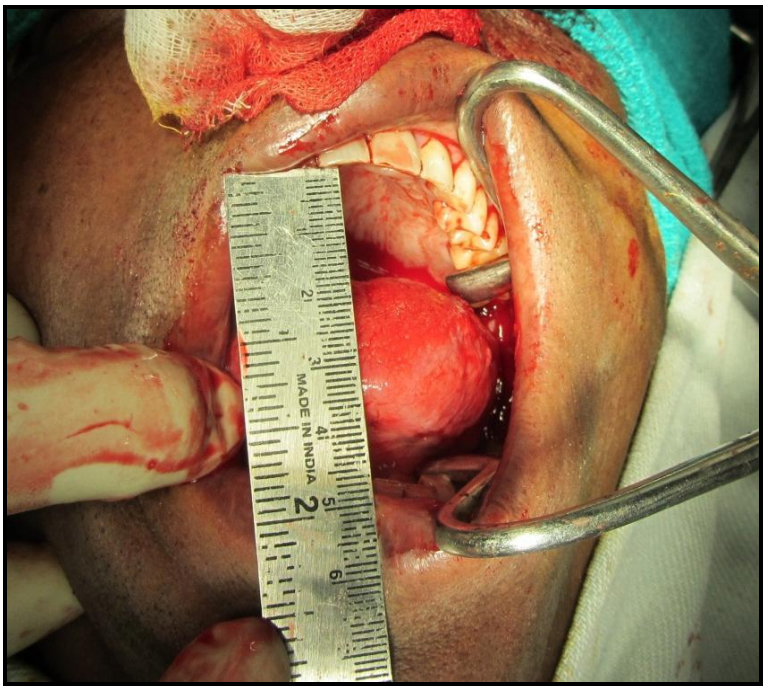


Figure 13 : Mouth opening after incision of fibrous bands and bilateral coronoidectomy

Figure 14 : Marking of Nasolabial flap

Figure 15 : Flap elevated after Perforator dissection Right side

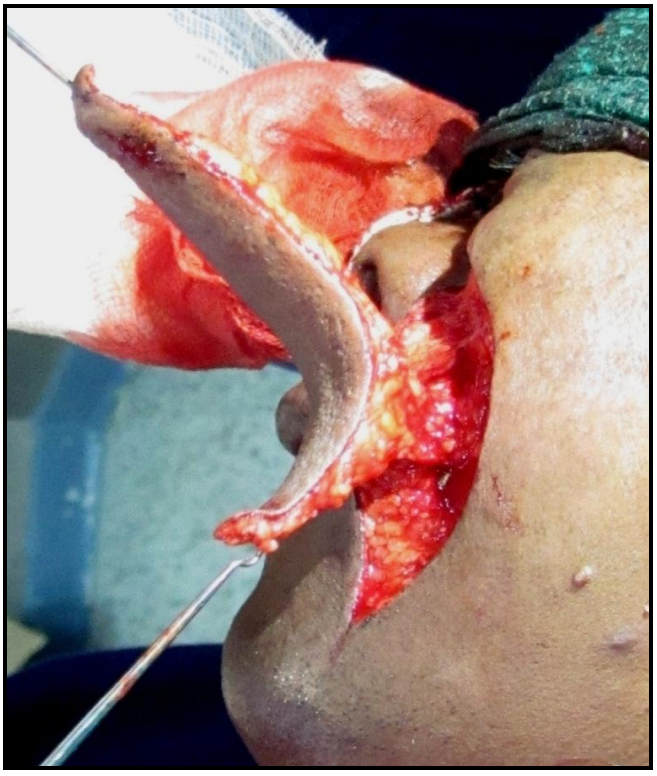


Figure 16 : Flap elevated after Perforator dissection Left side

Figure 17 : Flap on a single dominant perforator preserving a cuff of fatty tissue for minuscule as there is no obvious veneules

Figure 18 : Creation of transbuccal tunnel

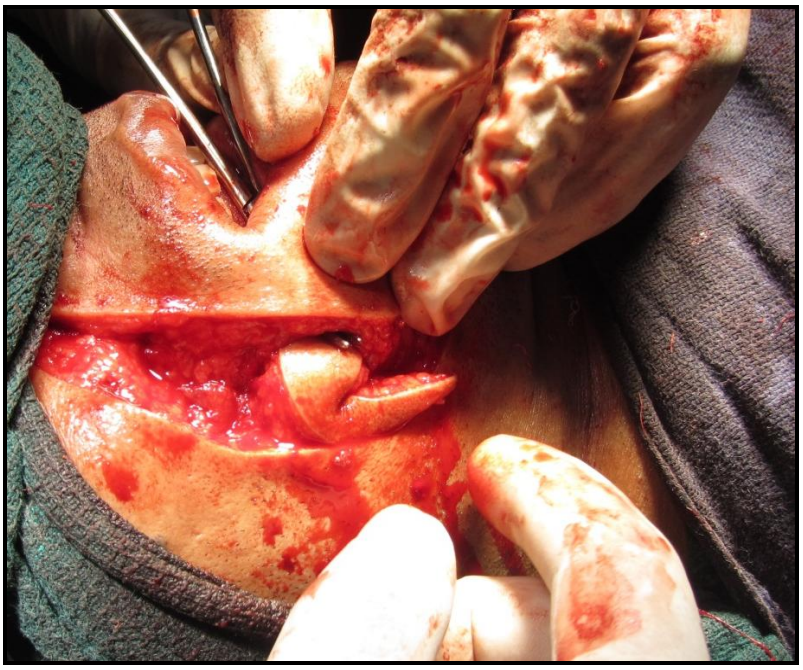


Figure 19 : Transposing the flap intraorally

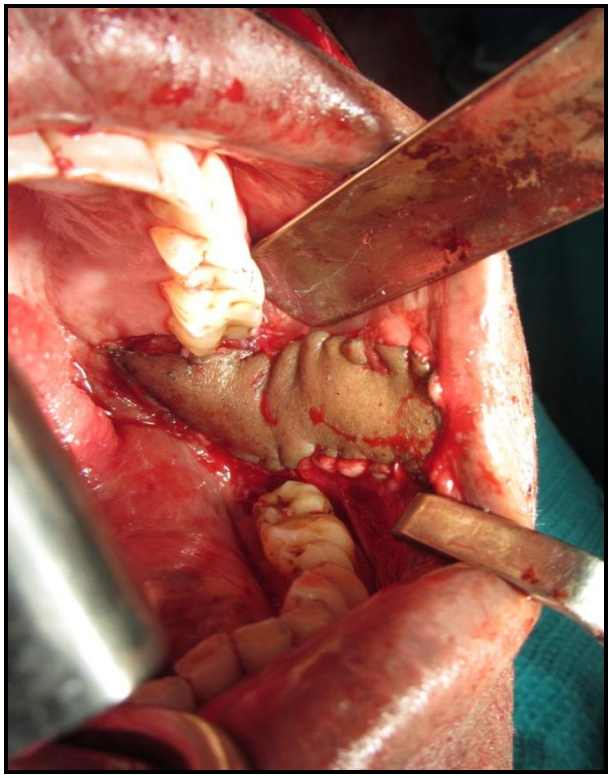


Figure 20 : Flap sutured over the defect (left side)

Figure 21 : Flap sutured over the defect (right side)

Figure 22 : Extraoral suturing of secondary defect

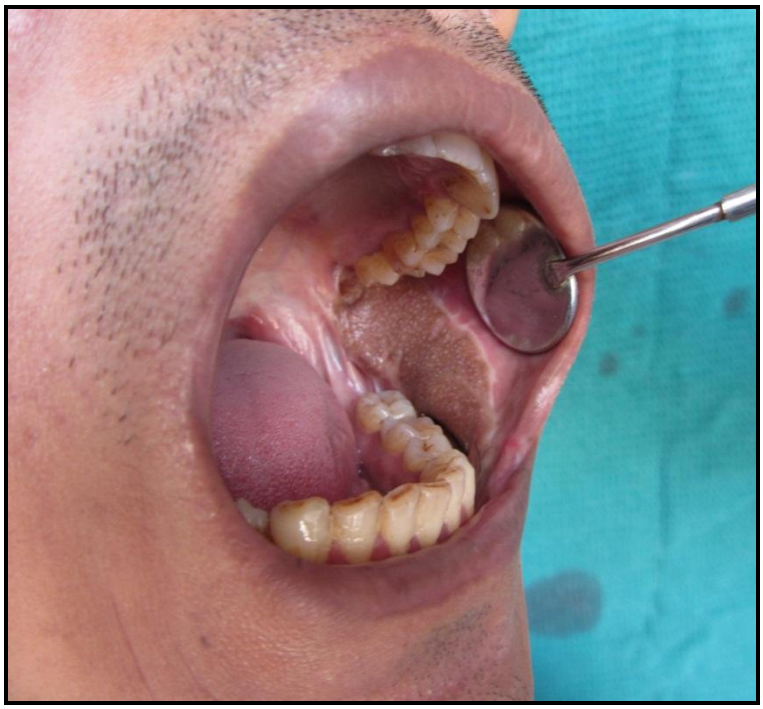


Figure 23 : Adaptation of flap after three months with adequate mouth opening

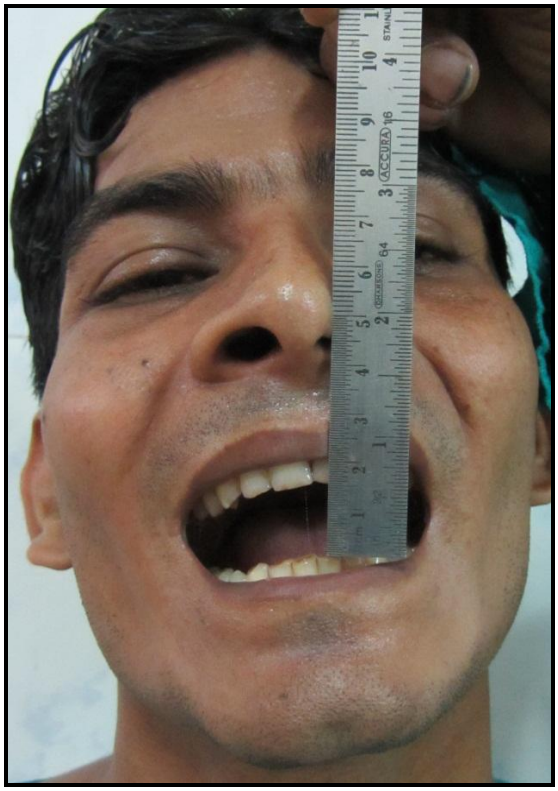


Figure 24 : Pre op mouth opening

Figure 25 : Post op mouth opening at 3 months follow up

Figure 26 : Another patient with restricted mouth opening. He underwent similar procedure as enumerated above

Figure 27 : and immediate post op picture

RESULTS

This retrospective analysis study was conducted to analyse the results of Facial artery perforator based nasolabial flap in the surgical management of oral submucosal fibrosis. The clinical application is based on the cadaveric dissections conducted in Nov 2010 in our department. The results were statistically analyzed.

Cadaveric Dissection Data:

14 cadaveric specimens were dissected to study about the perforators from the facial artery seen in the perforator triangle.

The average size of perforators on the **left side:**

Table 1: Descriptive Statistics

	Mean	Std. Deviation	N
Size mm	1.400	.0961	14
No of perf	2.29	.611	14

Correlations

		Size mm	No of perf
Size mm	Pearson Correlation	1	-.917 **
	Sig. (2-tailed)		.000
	N	14	14
No of perf	Pearson Correlation	-.917 **	1
	Sig. (2-tailed)	.000	
	N	14	14

**. Correlation is significant at the 0.01 level (2-tailed).

The average perforator size on the **right side:**

Table 2: Descriptive Statistics

	Mean	Std. Deviation	N
Size mm	1.429	.0994	14
No of perf	2.21	.579	14

Correlations

		Size mm	No of perf
Size mm	Pearson Correlation	1	-.783**
	Sig. (2-tailed)		.001
	N	14	14
No of perf	Pearson Correlation	-.783**	1
	Sig. (2-tailed)	.001	
	N	14	14

**. Correlation is significant at the 0.01 level (2-tailed).

There is a negative correlation between the size of the perforator and number of perforators and is statistically significant. As the number of perforator decreases the vessel caliber increases.

Therefore the average size of perforators both right and left side together seen was 1.4 mm.

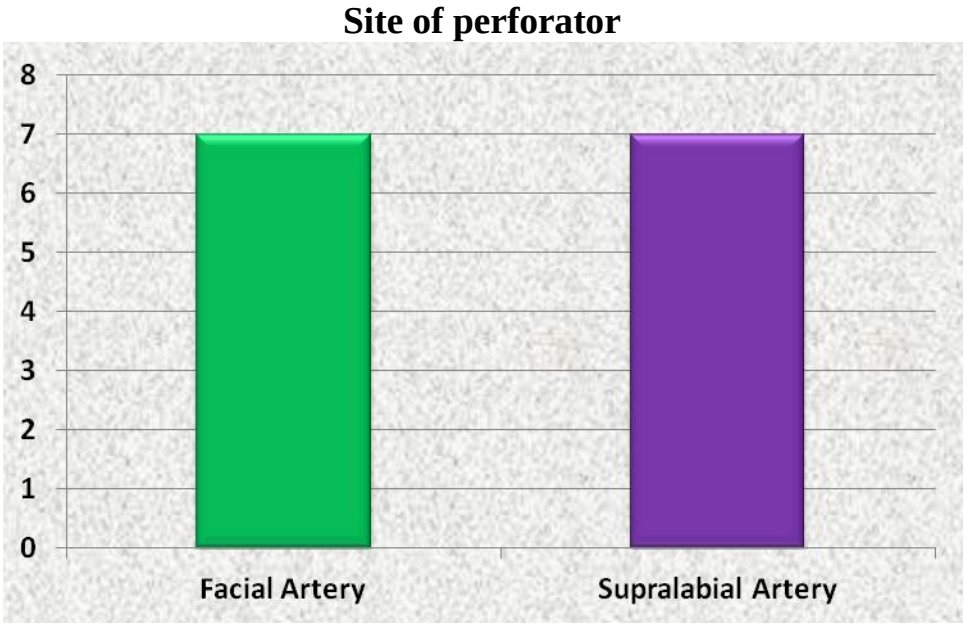
The average number of perforators both sides together was 2.2.

There was no vein seen accompanying the perforators in this cadaveric study.

Table: 3 Location of perforators

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Facial	7	50.0	50.0	50.0
	SL	7	50.0	50.0	100.0
	Total	14	100.0	100.0	

The site of origin of perforators was analysed. It is found to arise from the facial artery in 50 % of cases and from Superior labial artery in the other 50%.



Clinical Data:

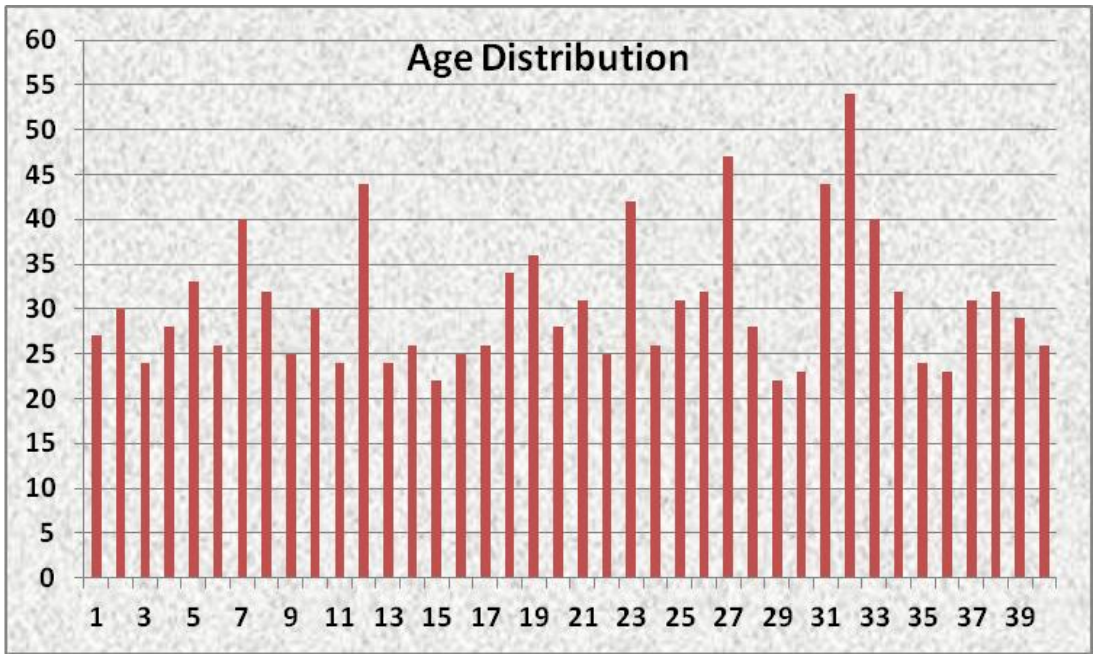
40 clinical cases were operated during this period.

Age:

Minimum age was 22 and maximum age was 54 in the study group with a mean age of 30.65.

Table 4 : Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	40	22	54	30.65	7.530
Valid N (listwise)	40				



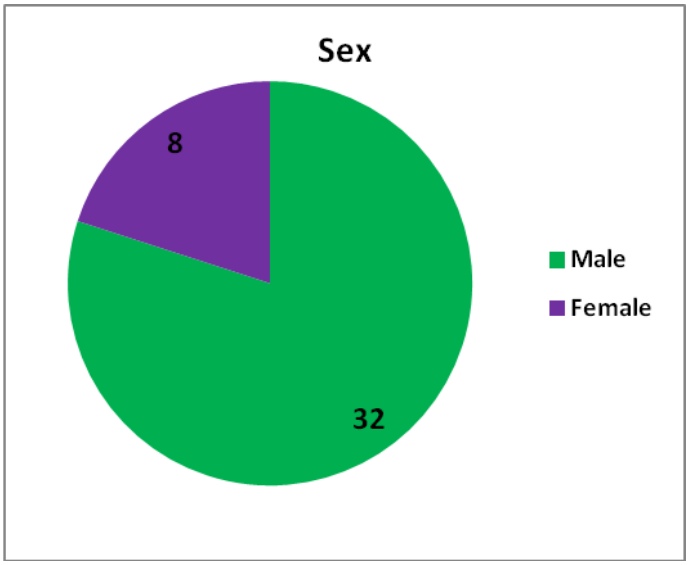
Age in years

Sex:

Of these 32 were males making upto 80% and 8 patients were females making upto 20% of the study population.

Table 5 : Sex

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	32	80.0	80.0	80.0
	Female	8	20.0	20.0	100.0
	Total	40	100.0	100.0	

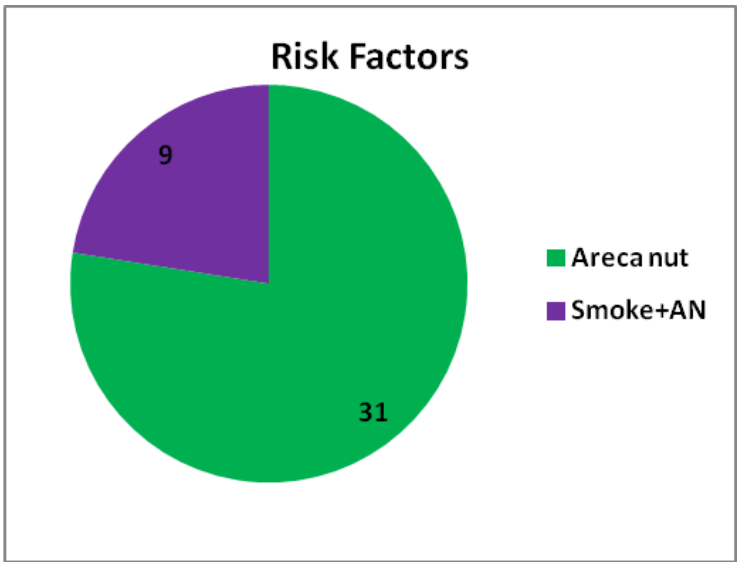


Risk Factors:

All patients presented with positive history of deleterious chewing habits involving some form of areca nut, tobacco for variable duration.

Table 6 : Risk Factors

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Areca nut	31	77.5	77.5	77.5
	Smoke+AN	9	22.5	22.5	100.0
	Total	40	100.0	100.0	



31 patients chewed areca nut, tobacco alone accounting to 77.5%

9 patients chewed areca nut, tobacco along with smoking habit 22.5%.

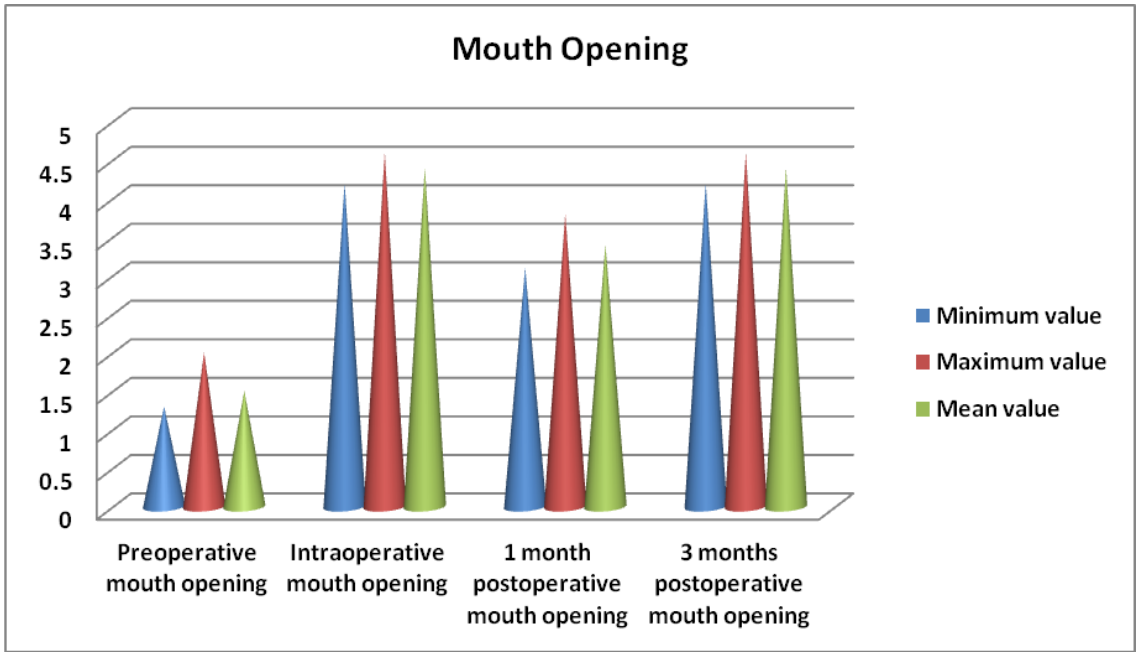
Mouth opening was measured for each patient at various stages of treatment procedure. These stages were,

1. Preoperative mouth opening
2. Intraoperative mouth opening
3. 1 month postoperative mouth opening
4. 3 months postoperative mouth opening

These are tabulated and statistically analysed

Table 7: Assessment of Mouth Opening

	Minimum value	Maximum value	Mean value
Preoperative mouth opening	1.3 cm	2 cm	1.555 cms
Intraoperative mouth opening	4.2 cms	4.6 cms	4.432 cms
1 month postoperative mouth opening	3.1 cms	3.8 cms	3.441 cms
3 months postoperative mouth opening	4.2 cms	4.6 cms	4.432 cms

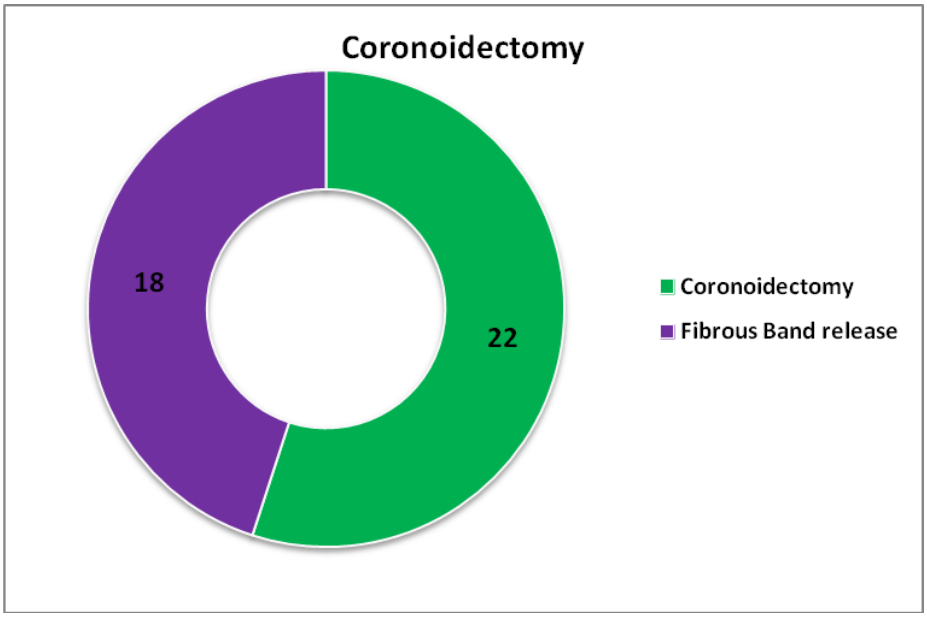


On comparing the pre operative mouth opening with 3 months postoperative mouth opening there is a significant difference with a $P<0.001$.

22 patients that is 55% of the patients underwent coronoidectomy as an adjunctive procedure to achieve adequate mouth opening.

Table 8 : Adjunctive Procedure

		Frequency	Percent	Valid Percen	Cumulative Percent
Valid	Coronoidectomy	22	55.0	55.0	55.0
	Fibrous Band release	18	45.0	45.0	100.0
	Total	40	100.0	100.0	



Flap dimension

The minimum Flap dimension harvested was 6.5 cm x 2.5cm = 16.25 cm^2

[Average of rt & lt sides]

The maximum flap dimension harvested was 8.3 cm x 3.3 cm = 27.3 cm^2

[Average of rt & lt sides]

Mean flap dimension was 23.12 cms^2

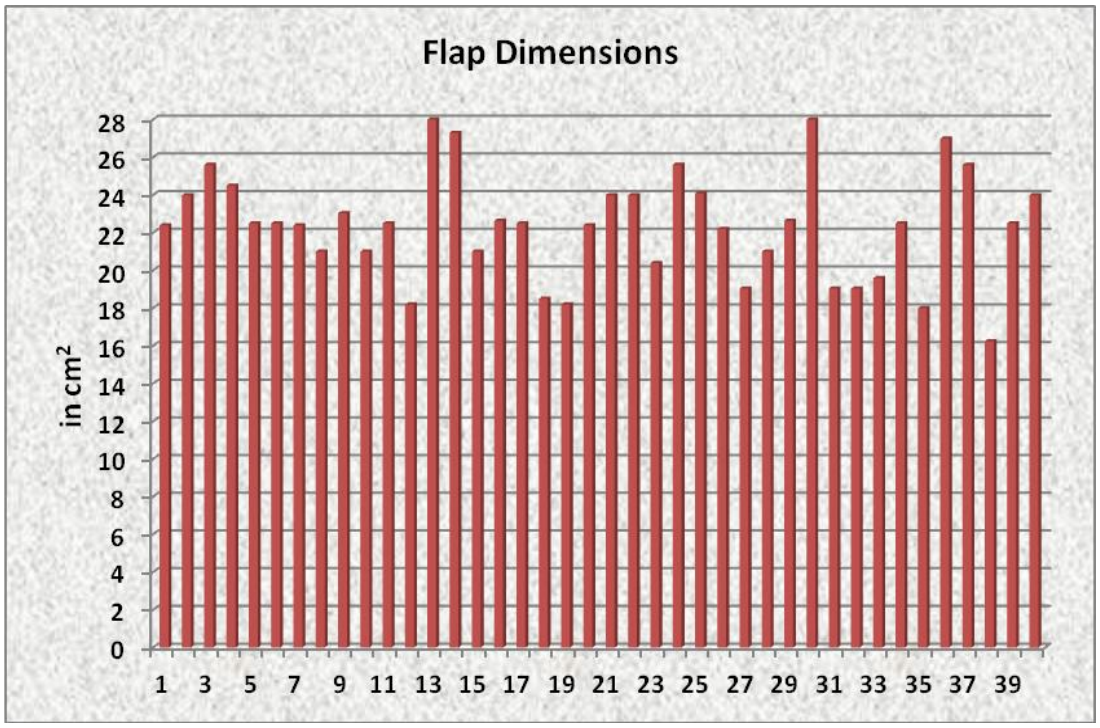
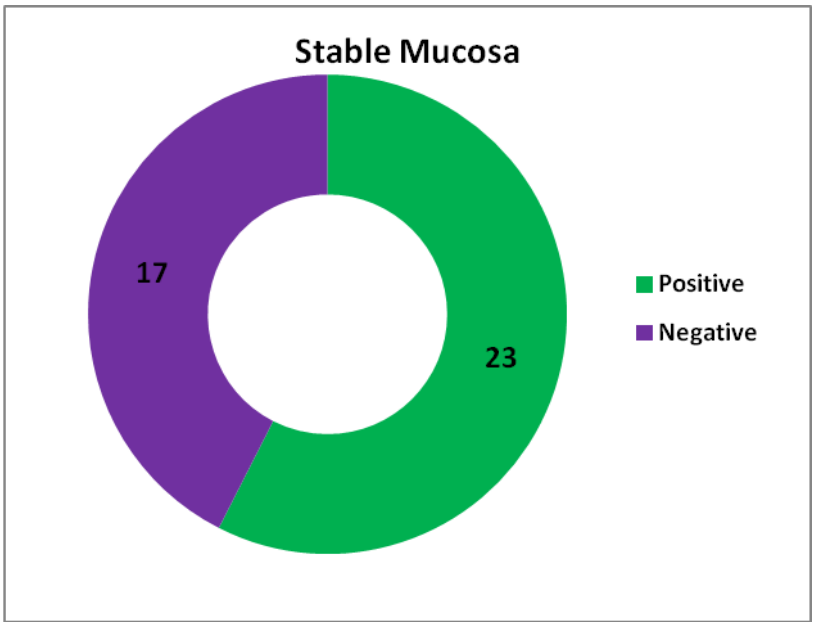


Table 9 : Stable mucosa

		Frequency	Percent	Valid Percen	Cumulative Percent
Valid	Positive	23	57.5	57.5	57.5
	Negative	17	42.5	42.5	100.0
	Total	40	100.0	100.0	

After the procedure and abstinence from areca nut about 57.5% patients had a stable mucosa with tolerance to food at the end of 6 months on follow up.



DISCUSSION

In the Indian subcontinent, oral submucous fibrosis is a precancerous condition with high prevalence rate[3]. The soft palate, palatal fauces, uvula, tongue, labial mucosa are the common site of occurrence. The buccal mucosa and retro molar areas are the frequent sites[3]. It usually begins from the posterior part of oral cavity and progresses anteriorly. In our series also, buccal mucosa and retromolar areas were most commonly involved.

The most common etiological factors being chewing betel nut and tobacco .[49,50,51,] In our study, all patients had a positive history of chewing some form of betel nut or tobacco or combination of both for variable duration.

Burning sensation of mucosa, intolerance to hot and spicy food, mucosal blanching, vesiculation, excessive salivation, pigmentation change, ulceration, altered taste sensation, dryness of mouth, and recurrent stomatitis are the common clinical features seen in the early stages of oral submucosal fibrosis. There is fibrosis followed by stiffness in the buccal mucosa, soft palate and faucial pillars. Fibrotic bands become palpable which run vertically in the cheek region and circumferentially in the lips. Gradually, these fibrotic bands lead to

inability in opening the mouth. All our patients exhibited this pattern in at least one stage of disease.

The various conservative treatment modalities for oral submucous fibrosis were proposed in the literature. These include oral administration of vitamins,[53,54,55] antioxidants[55,56] and Iron supplements,[55] Zinc,[57] topical application of Gold[58] Iodides as well as intralesional injections of Hyaluronidase,[55] Hydrocortisone,[55] Placental extract,[55] Triamcinolone,[55] Interferon gamma,[59] and enzymes like Collagenase,[55,60] Chymotrypsin.[55] Drugs like Pentoxifylline, Buflomedil Hydrocloride and Nylidrin were used to improve the circulation to the affected area.[55,61] All our patients had history of treatment with one or more of the conservative modalities yet their symptoms were progressing.

Surgical therapy is beneficial in cases presenting severe trismus and which are not responding to conservative line of management. After surgical therapy, oral mucosa should regain and retain its normalcy and there should be reduction in the risk of oral cancer.

Mere cutting of the fibrotic bands followed by forcible mouth opening and allowing secondary epithelization left an unsatisfactory rigid buccal mucosal surface even when attempts were made to reduce

collagen formation by insertion of steroid impregnated packs.[50] It results in scar formation and recurrence of trismus.

Additional procedures like temporalis myotomy and bilateral Coronoidectomy can be performed to enhance mouth opening.[62, 63]and in our series few patients underwent Coronoidectomy to achieve adequate mouth opening.

Disappointing results were obtained while covering the raw area after excision of fibrous band with split thickness skin graft as graft take was poor initially, shrinkage and contracture were found to be very high because of the poor oral conditions and this leads to recurrence of symptoms.[12] Split thickness skin grafts along with bilateral temporalis muscle myotomy or Coronoidectomy were effective, but have the drawbacks of secondary contracture formation in temporalis tendon and muscle and pterygomandibular raphae, which appears to be the principal cause of restricted mouth opening.[50] Recurrence of symptoms was common in the studies conducted by Khanna & Andrade,[43] Lai. D.R.[64] and Glenn Morawetz et al.[58] The other limitation split thickness skin graft is the morbidity associated with donor site along with maintenance of mouth opening post operatively for 7 to 10 days which is the most unpleasant and uncomfortable experience for the patient.[50]

Khanna and Andrade[43] used Palatal island flaps based on greater palatine artery to cover the defects of oral submucous fibrosis. Though the techniques of harvesting the palatal island flaps were found to be simple, it has its own limitations. The palatal flap may be involved with fibrosis, second molar tooth extraction is required for flap cover without tension and flap dimensions may be inadequate to cover the defect.[44]

Tongue flaps have also been used for treating oral submucous fibrosis. The disadvantages are postoperative dysphagia, disarticulation, the risk of postoperative aspiration. Second stage procedure needed for detachment of the pedicle[12]. The tongue may also be involved in oral submucous fibrosis. [12, 62]

Application of amniotic membrane is of little benefit when used in single layer over deep buccal defects.[44] Human placental grafts can also be applied to cover the defects. It has shown little beneficial results when combined with submucosal injection of Dexamethasone.[4]

Micro vascular work for free tissue transfer in the form Bilateral radial artery forearm free flaps[15] , the bipaddled radial forearm flap[16] , the anterolateral thigh[18] may be needed when the flap defect size is large and the local/regional flaps are violated. Donor site morbidity as

well as unsightly scar formation is the major disadvantage. The flaps are hairy and 40% of the patients require secondary de-bulking procedures.

Present study was conducted with an aim of achieving results in terms of mouth opening and reduction of symptoms by transecting the fibrous bands and reconstruction using nasolabial perforator/propellar flap. This retrospective study included 40 patients with clinically and histopathologically confirmed diagnosis of oral submucous fibrosis.

The anatomical studies lead to the novel way of perforator dissection that is constantly seen in the perforator triangle. Nasolabial flap with robust vascularity can be harvested as Adhoc perforator/propellar flap.

Sizeable Nasolabial flap can be harvested on a single best perforator after trial clamping resulted in hyperperfused nasolabial flap. The nasolabial flaps has advantages such as, the donor site is in the same operating field, reliable and rich vascularity, provides versatility in design, proximity to the defect, ease of flap elevation, supple skin, thus aiding in increasing mouth opening and causing minimal aesthetic deformity.

This Adhoc nasolabial perforator/propeller flap provide a stable and supple tissue which get mucosalised within a period of six weeks gets elastic elongation during mouth opening and recoils back to a good contour on closing the mouth without forming any fold of flap which get caught in the molars. These methods of reconstruction paves the way for good masticatory efficiency [100%], maintain oral hygiene by good mouth opening [100%] and eschews hypersensitivity to hot and spicy food in 60% of cases within 3 months in our clinical study.

Though pedicled nasolabial flap can be used in a staged manner for intraoral reconstruction with intermediary oral cutaneous fistula, this method of reconstruction is single staged. This stable and supple tissue inhibits recurrence.

The anatomical study defined the safest passage of nasolabial flap for intraoral lining that is caudal to sensory buccal branch of trigeminal nerve wherein the orbicularis oris muscle fibres are split. Then the flap is tunnelled intra orally without undue tension and kinking of pedicle.

In our institution with 1 year follow up no recurrence is reported.

As noted in other studies the commonest occurrence of carcinoma is from the cheek segment 70%.This method of reconstruction completely brings in a new stable mucosolised epithelium which is free from any unstable epithelium for malignant transformation.

What we found in our cases after reconstruction with counselling to the patient with complete abstinence from tobacco exposure no cancer found and precancerous unstable epithelium in palate, floor of mouth healed well in 1 year follow-up.

CONCLUSION

Oral sub mucosal fibrosis is a progressive disease leading to trismus. Surgical release of fibrous bands and reconstruction with regional flaps is a very good option. Facial artery perforator based nasolabial flap offers excellent result in the form supple cover to the defect and least donor site morbidity.

The presence of constant perforators in the perforator triangle as evidenced in the anatomical study paved way for this novel technique of flap harvest.

Adequate mouth opening which is the prime goal is achieved with good stable cover and is maintained with good physiotherapy, abstinence from areca nut and tobacco chewing.The present study showed the easy way of flap harvest and is easily reproducible by all the surgeons.

This technique of utilising nasolabial flap as a perforator flap is a single staged procedure with no flap complications, least donor site morbidity and good aesthetic and functional outcome can be considered for all patients with oral sub mucosal fibrosis.

BIBLIOGRAPHY

1. Gupta D., Sharma S.C. “Oral submucous fibrosis – a newtreatment regimen.” J Oral Maxillofac Surg 1988;46:830–3.
2. Pindborg J.J., Murti P.R., Bhonsle R.B., Gupta P.C., Daftary D.K., Mehta F.S. “Oral submucous fibrosis as a precancerous condition.” Scand J Dent Res 1984;92:224–9.
3. Paymaster J.C. “Cancer of the buccal mucosa: clinical study of 650 cases in Indian patients.” Cancer 1956;9:431–5.
4. Borle R.M., Nimonkar P.V., Rajan R. “Extended nasolabial flaps in the management of oral submucous fibrosis.” Br J Oral Maxillofac Surg 47:382, 2009
5. Cameron RR. Nasolabial and cheek flaps. Grabb's Encyclopedia of flaps, 2nd ed. B. Straunch, L.O.Vanconez and E.J. Hall-Findlay. Eds. Lippincott-Raven. Philadelphia. 1998, 1: 56-61
6. da Silva GA. A new method of reconstructing the columella with a nasolabial flap. Plast Reconstr Surg.1964, 34: 63.
7. Kaplan I. Reconstruction of the collumella. Br J Plast Surg. 1972, 25: 37.
8. Yanai A, Nagata S, Tanaka H. Reconstruction of the collumella with bilateral nasolabial flaps. Plast Reconstr Surg. 1986, 77: 129

9. Ohtsuka H. Nasolabial flaps to the cheek. Grabb's Encyclopedia of flaps, 2nd ed. B. Straunch, L.O. Vanconez and E.J. Hall-Findlay. Eds. Lippincott-Raven. Philadelphia. 1998, 375-377.
10. Kaluzinski E, Crasson F, Alix T, Labbe D. Nasolabial flap reconstruction of the collumella. Rev Stomatol Chir Maxillofac. 2004, 105: 171
11. Ran W, Fan X, Tan Z, Ni S. Clinical application of a retrograde nasolabial fold island flap based on the upper labial artery. Zhonghua Zheng Xing Wai ke Za Zhi. 2002, 18: 25.
12. Varghese BT, Sebastian P, Cherian T, Mohan PM, Ahmed I, Koshy C, et al. Nasolabial flaps in oral reconstruction: an analysis of 224 cases. Br J Plast Surg. 2001, 54: 499.
13. Taylor GI. The angiosomes of the body and their supply to perforator flaps. Clin Plast Surg 30:331-342, 2003.
14. Manchot C. [The Cutaneous Arteries of the Human Body]. Translated by Ristic j, Morain WD. New York: Springer-Verlag, 1982.
15. Salmon M, Taylor GI, Tempest MN, eds. Arteries of the Skin. London: Churchill Livingstone, 1988.
16. Koshima I, Yamamoto T, Narushima M, Mihara M, Iida T. Clin Plast Surg. 2010 Oct;37(4):683-9

17. McCraw JB, Arnold PG. McCraw and Arnold's Atlas of Muscle and Musculocutaneous Flaps. Norfolk, VA: Hampton Press, 1986.
18. Taylor GI, Gianoutsos MP, Morris SF. The neurovascular territories of the skin and muscles: Anatomic study and clinical implications. Plast Reconstr Surg 94:1-36, 1994.
19. Hallock GG. Direct and indirect perforator flaps: The history and the controversy. Plast Reconstr Surg 111:855-865,2003
20. Schmidt BL, Dierks EJ: The nasolabial flap. Oral & Maxillofacial Surgery Clinics of North America, 2003;15(4): 487-495
21. Cormack G, Lamberty B. The arterial anatomy of skin flaps. Edinburgh (UK): Churchill Livingstone; 1986.
22. D'Arpa S, Cordova A, Pirrello R, Moschella F. One-stage reconstruction of the nasal ala: the free-style nasolabial perforator flap. Plast Reconstr Surg. 2009 Feb;123(2):65e-66e
23. Mardini S,TsaiFC,WeiFC. The thigh as a model for free style free flaps. Clin Plast Surg 2003; 30(3):473–80.
24. Wei FC, Jain V, Suominen S, et al. Confusion among perforator flaps: what is a true perforator flap? Plast Reconstr Surg 2001;107(3):874–6.

25. Blondeel PN, Beyens G, Verhaeghe R, et al. Doppler flowmetry in the planning of perforator flaps. Br] Plast Surg 51:202-209, 1998.
26. Elliot RAJr. Use of nasolabial skin flap to cover intraoral defects. Plast Reconstr Surg 58:201, 1976.
27. Pindborg J.J., Sirsat S.M. “Oral submucous fibrosis.” Oral Surg Oral Med Oral Pathol 1966;22(6):764-779.
28. Gewirtz H.S., Eilber F.R., Zream H.A. "Use of nasolabial flap for reconstruction of the floor of the mouth". Am J Surg, 1978; 136: 508-511.
29. Gupta D.S., Gupta M.K., Golhar B.L. "Oral submucous fibrosis – clinical study and management by physiofibrolysis (MWD)". J Indian Dent Asso, 1980; 52: 375-378.
30. J.J.Pindborg; Fali S.Mehta “Incidence and early forms of oral Submucous fibrosis”. Oral Surg July, 1980.
31. D.J.C. Yen., “Surgical treatment of submucous fibrosis,” Oral Surgery, Oral Medicine, and Oral Pathology, vol. 54, no. 3, pp. 269–272, 1982.
32. Murti P.R., Bhonsale R.B., Pindborg J.J., Daftary D.K., Gupta P.C., Mehta F.S. “Malignant transformation rate in oral submucous fibrosis over a 17 year period.” Community Dent Oral Epidemiol 1985;13:340–1.

33. Canniff J.P., Harvey W., Harris M. “Oral submucous fibrosis- its pathogenesis and management.” Br Dent J 1986;160:429–33.
34. Tideman H., Bosanquet A., Scott J. “Use of the buccal fat pad as a pedicled graft.” J Oral Maxillofac Surg 44:435, 1986
35. Morgan R.F., Chambers R.G., Jaques D.A., Hoopes J.E. "Nasolabial flap in intraoral reconstruction – Review of 55 cases". Am J Surg, 1981; 142: 448-450.
36. Paissat DK: Oral submucous fibrosis. International Journal of Oral Surgery, 1981;10(5):307-312.
37. Gupta D., Sharma S.C. “Oral submucous fibrosis – a newtreatment regimen.” J Oral Maxillofac Surg 1988;46:830–3.
38. Hynes B., Boyd J.B. “The nasolabial flap – Axial or Random.” Arch Otolaryngol Head Neck Surg, 1988; 114: 1389-1391.
39. Pogrel M.A., Shariati S., Schmidt B., Faal Z.H., Regezi J. “The surgical anatomy of the nasolabial fold.” Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1998; 86: 410-5.
40. Borle R.M., Borle S.R. "Management of oral submucous fibrosis: A conservative Approach". J Oral Maxillofac Surg, 1991; 49: 788-791.
41. Pillai, R., Balaram, P., and Reddiar K. S. “Pathogenesis of oral submucous fibrosis.” Cancer 69: 2011, 1992.

42. N.Samman. “The buccal fat pad in oral reconstruction” Int.J.Oral maxillofacial Surg 1993:22:2-6.
43. Khanna J.N , Andrade N.N. “Oral submucous fibrosis: a new concept in surgical management - Report of 100 cases.” Int J Oral Maxillofac Surg 1995;24:433–9.
44. D.R.Lai “Clinical evaluation of different treatment methods for oral submucous fibrosis.” A 10 –year experience with 150 cases” J oral Pathol med 24:402-406, 1995.
45. Murti P.R., Bhonsle R.B., Gupta P.C., Daftary D.K., Pindborg J.J., Mehta F.S. "Etiology of oral submucous fibrosis with special reference to the role of areca nut chewing". J Oral Pathol Med, 1995; 24: 145-52.
46. Yeh C.J. “Application of the buccal fat pad to the surgical treatment of oral submucous fibrosis.” Int J Oral Maxillofac Surg 1996;25:130–3.
47. Ducic Y., Burye M. “Nasolabial flap reconstruction of oral cavity defects: A report of 18 cases.” J Oral Maxillofac Surg, 2000; 58: 1104-1108.
48. S. M. Haider. “Clinical and functional staging of oral submucous fibrosis” British Journal of Oral and Maxillofacial Surgery (2000) 38, 12–15

49. Canniff J.P., Harvey W., Harris M. “Oral submucous fibrosis- its pathogenesis and management.” Br Dent J 1986;160:429–33.
50. Gupta D.S., Dolas R., Iqbal A. “Treatment modalities in submucous fibrosis- How they stand today?” Study of 600 cases. Indian J Oral Maxillofac Surg 1992;7:43.1.
51. Bhonsle R.B., Murthi P.R., Gupta P.C., Mehta F.S. “Reverse dhumti smoking in Goa—an epidemiological study of 5449 villages for oral precancerous lesions.” Indian J Cancer 1976; 13, 301-5.
52. Kakar PK, Puri RK, Venkatachalam VP: Oral submucous fibrosis-treatment with hyalase. Journal of Laryngology & Otology, 1985; 99(1):57-59.
53. Aziz SR. “Oral submucous fibrosis: case report and review of diagnosis and treatment.” J Oral Maxillofac Surg 2008;66:2386–9.
54. Mehrotra D., Pradhan R., Gupta S. “Retrospective comparison of surgical treatment modalities in 100 patients with oral submucous fibrosis.” Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2009;107:e1–0.
55. Xiaowen Jiang, and Jing Hu. “Drug Treatment of Oral Submucous Fibrosis: A Review of the Literature” 2009

American Association of Oral and Maxillofacial Surgeons J Oral Maxillofac Surg 67:1510-1515, 2009

56. Gupta S., Reddy M.V.R., Harinath B.C. “Role of oxidative stress and antioxidants in aetiopathogenesis and management of oral submucous fibrosis.” Indian J Clin Biochem 19:138, 2004
57. Kumar A., Sharma S.C., Sharma P., et al. “Beneficial effect of oral zinc in the treatment of oral submucous fibrosis.” Indian J Pharmacol 23:236, 1991
58. Morawetz G., Katsikeris N., Weinberg S., Listrom R. "Oral submucous fibrosis". J Oral Maxillofac Surg, 1987; 16: 609-614.
59. Haque M.F., Meghji S., Nazir R., et al. “Interferon gamma may reverse oral submucous fibrosis.” J Oral Pathol Med 30:12, 2001
60. Lin H.J., Lin J.C. “Treatment of oral submucous fibrosis by collagenase: Effects on oral opening and eating function.” Oral Dis 13:407, 2007
61. Sharma J.K., Gupta A.K., Mukhija R.D., et al. “Clinical experience with the use of peripheral vasodilator in oral disorders.” Int J Oral Maxillofac Surg 16:695, 1987
62. Borle R.M., Borle S.R. "Management of oral submucous fibrosis: A conservative Approach". J Oral Maxillofac Surg, 1991; 49: 788-791.

63. M.C. Kothari, N. Hallur, B. Sikkerimath, S. Gudi, C.R. Kothari. “Coronoidectomy, masticatory myotomy and buccal fat pad graft in management of advanced oral submucous fibrosis.” Int. J. Oral Maxillofac. Surg. 2012; 41: 1416–1421.

PROFORMA FOR CADAVER DISSECTION

STUDY TITLE : ANATOMICAL STUDY OF FACIAL ARTERY PERFORATOR AND ITS CLINICAL APPLICATION IN ORAL SUBMUCOSAL FIBROSIS

Serial No.

Sex:

Preserved cadaver

Facial artery perforator Caliber : Right Left

Site of origin : Facial Supra labial

Total Number of perforators

In the perforator triangle :

Presence of Vein

Documentation

PROFORMA

STUDY TITLE: ANATOMICAL STUDY OF FACIAL ARTERY PERFORATOR AND ITS CLINICAL APPLICATION IN ORAL SUBMUCOSAL FIBROSIS

Study Centre **:** Department of Plastic Reconstructive & Maxillofacial Surgery MMC, RGGGH, Chennai 600003

Patient's Name **:** Date of admission:

Date of Surgery**:**

Age /Sex : Date of Discharge:

P.S No **:** Ps Unit

Risk Factor **:** Areca nut/Areca nut + Smoking

Duration :

Diagnosis : Oral sub mucosal fibrosis

Mouth opening :

[pre-op]

Biopsy report :

OPG :

Assessment date :

Done by : Asst .by:

Intubation : Blind nasal/ Fibreoptic /Retrograde

Anaethesiologist :

Findings :

Adjuvant Procedure: Coronoidectomy

Mouth opening :

[Intra op]

No.of perforators :

Flap Dimension :

Rt :

Lt :

Average :

Post op immediate :

Flap colour :

Warmth :

Bleeding :

Other complications (if any):

Follow Up :

1st Month : Mouth opening :

3rd Month: Mouth opening :

6th Month: Adequate/ Inadequate :

1 year :

MASTER CHART CADAVER DISSECTION

Cadaver	Sex	Left			Right		
		Size mm	No of perf	location	Size mm	No.of perf	location
1	male	1.3	3	facial	1.5	2	facial
2	male	1.3	3	sl	1.4	3	sl
3	female	1.6	1	facial	1.3	2	facial
4	male	1.4	2	sl	1.5	2	sl
5	male	1.3	3	sl	1.5	2	sl
6	male	1.4	2	sl	1.3	3	sl
7	female	1.5	2	facial	1.5	2	facial
8	male	1.3	3	facial	1.4	2	facial
9	male	1.5	2	sl	1.4	2	sl
10	female	1.4	2	facial	1.3	3	facial
11	female	1.4	2	sl	1.6	1	sl
12	male	1.4	2	sl	1.5	2	sl
13	male	1.3	3	facial	1.3	3	facial
14	male	1.5	2	facial	1.5	2	facial

MASTER CHART CLINICAL DATA

sl.no	P S NO	age	sex	Diagnosis	Risk fact.	Adjunctive	flap comp	D.morb	Preop mo	post op mo	follow up	1 month	3 months	Flap dime	Dimensions	Stable mucosa
1	323/10	27	male	OSMF	Areca nut	Coronoidectomy	NIL	NIL	1.6	4.5	1 year	3.2	4.5	7x3.2	22.4	+
2	340/10	30	male	OSMF	Areca nut	Nil	NIL	NIL	1.3	4.3	1 year	3.5	4.3	8 x3	24	
3	361/10	24	male	OSMF	Areca nut	Coronoidectomy	NIL	NIL	1.2	4.5	1 year	3.6	4.5	8x3.2	25.6	+
4	71/11	28	male	OSMF	Areca nut	Coronoidectomy	NIL	NIL	1.7	4.5	1 year	3.6	4.5	7x3.5	24.5	
5	94/11	33	male	OSMF	Areca nut	Coronoidectomy	NIL	NIL	1.4	4.5	1 year	3.8	4.5	7.5 x 3	22.5	+
6	101/11	26	male	OSMF	Areca nut	Coronoidectomy	NIL	NIL	1.8	4.5	1 year	3.3	4.5	7.5 x 3	22.5	
7	123/11	40	female	OSMF	Areca nut	Coronoidectomy	NIL	NIL	2	4.5	1 year	3.3	4.5	7 x3.2	22.4	+
8	140/11	32	male	OSMF	Areca nut	Nil	NIL	NIL	1.4	4.5	1 year	3.9	4.5	7 x 3	21	+
9	157/11	25	male	OSMF	Areca nut	Nil	NIL	NIL	1.5	4.2	1 year	3.2	4.2	7.2x 3.2	23.04	+
10	180/11	30	male	OSMF	Smoke+AN	Coronoidectomy	NIL	NIL	1.2	4.5	1 year	3.6	4.5	7x 3	21	+
11	192/11	24	male	OSMF	Areca nut	Coronoidectomy	NIL	NIL	1.3	4.5	1 year	3.3	4.5	7.5 x 3	22.5	+
12	207/11	44	female	OSMF	Areca nut	Nil	NIL	NIL	1.4	4.3	1 year	3.3	4.3	7x2.6	18.2	+
13	227/11	24	male	OSMF	Areca nut	Coronoidectomy	NIL	NIL	1.6	4.6	1 year	3.6	4.6	8 x 3.5	28	+
14	242/11	26	male	OSMF	Smoke+AN	Nil	NIL	NIL	1.5	4.3	1 year	3.8	4.3	8.3 x 3.3	27.3	
15	271/11	22	male	OSMF	Areca nut	Nil	NIL	NIL	1.8	4.5	1 year	3.5	4.5	7 x 3	21	
16	290/11	25	male	OSMF	Areca nut	Coronoidectomy	NIL	NIL	1.5	4.5	1 year	3.65	4.5	7.3 x 3.1	22.63	
17	301/11	26	male	OSMF	Areca nut	Coronoidectomy	NIL	NIL	1.9	4.6	1 year	3.7	4.6	7.5 x 3	22.5	+
18	314/11	34	male	OSMF	Smoke+AN	Nil	NIL	NIL	1.9	4.4	1 year	3.5	4.4	7.4 x 2.5	18.5	+
19	322/11	36	female	OSMF	Areca nut	Nil	NIL	NIL	1.9	4.3	1 year	3.4	4.3	7x2.6	18.2	+
20	345/11	28	male	OSMF	Areca nut	Nil	NIL	NIL	1.5	4.3	1 year	3.4	4.3	7 x 3.2	22.4	+

MASTER CHART CLINICAL DATA

sl.no	P S NO	age	sex	Diagnosis	Risk fact.	Adjunctive	flap comp	D.morb	Preop mo	post op mo	follow up	1 month	3 months	Flap dime	Dimensions	Stable mucosa
21	370/11	31	male	OSMF	Areca nut	Coronoidectomy	nil	nil	1.4	4.6	1 year	3.5	4.6	7.5 x 3.2	24	+
22	390/11	25	male	OSMF	Areca nut	Coronoidectomy	nil	nil	1.6	4.6	1 year	3.6	4.6	8x 3	24	
23	401/11	42	female	OSMF	Smoke+AN	Coronoidectomy	nil	nil	1.6	4.6	1 year	3.4	4.6	6.8 x3	20.4	+
24	413/11	26	male	OSMF	Areca nut	Nil	nil	nil	1.5	4.2	1 year	3.1	4.2	8 x3.2	25.6	+
25	426/11	31	male	OSMF	Areca nut	Coronoidectomy	nil	nil	1.5	4.5	1 year	3.2	4.5	7.3x3.3	24.09	
26	52/12	32	male	OSMF	Smoke+AN	Nil	nil	nil	1.7	4.3	1 year	3.6	4.3	7.4 x3	22.2	+
27	93/12	47	female	OSMF	Areca nut	Coronoidectomy	nil	nil	1.4	4.5	1 year	3.4	4.5	6.8x2.8	19.04	
28	106/12	28	male	OSMF	Areca nut	Nil	nil	nil	1.8	4.1	1 year	3.1	4.1	7 x 3	21	+
29	144/12	22	male	OSMF	Areca nut	Nil	nil	nil	1.6	4.2	1 year	3.3	4.2	7.3 x 3.1	22.63	
30	189/12	23	male	OSMF	Areca nut	Coronoidectomy	nil	nil	1.5	4.6	1 year	3.3	4.6	8 x 3.5	28	
31	202/12	44	female	OSMF	Areca nut	Coronoidectomy	nil	nil	1.4	4.6	1 year	3	4.6	6.8x2.8	19.04	
32	229/12	54	female	OSMF	Areca nut	Nil	nil	nil	1.4	4.4	1 year	3.4	4.4	6.8x2.8	19.04	
33	248/12	40	female	OSMF	Areca nut	Coronoidectomy	nil	nil	1.5	4.5	1 year	3.3	4.5	7 x2.8	19.6	+
34	283/12	32	male	OSMF	Areca nut	Nil	nil	nil	1.3	4.3	1 year	3.1	4.3	7.5 x 3	22.5	+
35	300/12	24	male	OSMF	Smoke+AN	Coronoidectomy	nil	nil	1.5	4.6	6 /12	3.2	4.6	6x 3	18	+
36	318/12	23	male	OSMF	Areca nut	Nil	nil	nil	1.5	4.2	6 /12	3.2	4.2	9 x3	27	
37	340/12	31	male	OSMF	Areca nut	Coronoidectomy	nil	nil	1.7	4.6	6 /12	3.6	4.6	8x3.2	25.6	
38	365/12	32	male	OSMF	Smoke+AN	Coronoidectomy	nil	nil	1.7	4.6	6 /12	3.6	4.6	6.5 x 2.5	16.25	+
39	390/12	29	male	OSMF	Smoke+AN	Nil	nil	nil	1.4	4.2	6 /12	3.8	4.2	7.5x3	22.5	
40	411/12	26	male	OSMF	Smoke+AN	Nil	nil	nil	1.8	4.3	6 /12	3.8	4.3	8 x3	24	

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI -3

Telephone No : 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To

Dr.K.Shyamnath Krishna Pandian,
III Year, Post Graduate in Plastic Surgery,
Madras Medical College, Chennai -3

Dear Dr.K.Shyamnath Krishna Pandian,

The Institutional Ethics committee of Madras Medical College, reviewed and discussed your application for approval of the proposal entitled "Anatomical study of facial artery perforator and its clinical application" No.25022013.

The following members of Ethics Committee were present in the meeting held on 05.02.2013 conducted at Madras Medical College, Chennai -3.

1. Dr.SivaKumar, MS FICS FAIS	--- Chairperson
2. Prof. R. Nandhini MD Director, Instt. of Pharmacology ,MMC, Ch-3	-- Member Secretary
3. Prof. Shyamraj MD Director i/c , Instt. of Biochemistry , MMC, Ch-3	-- Member
4. Prof. P. Karkuzhali. MD Prof., Instt. of Pathology, MMC, Ch-3	-- Member
5. Prof. A. Radhakrishnan MD Prof of Internal Medicine, MMC, Ch-3	-- Member
6. Prof. S. Deivanayagam MS Prof of Surgery, MMC, Ch-3	-- Member
7. Thiru. S. Govindsamy. BABL	-- Lawyer
8. Tmt. Arnold Soulina MA MSW	-- Social Scientist

We approve the proposal to be conducted in its presented form.

Sd/ Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.

R.Nandini 22/2/13
Member Secretary, Ethics Committee

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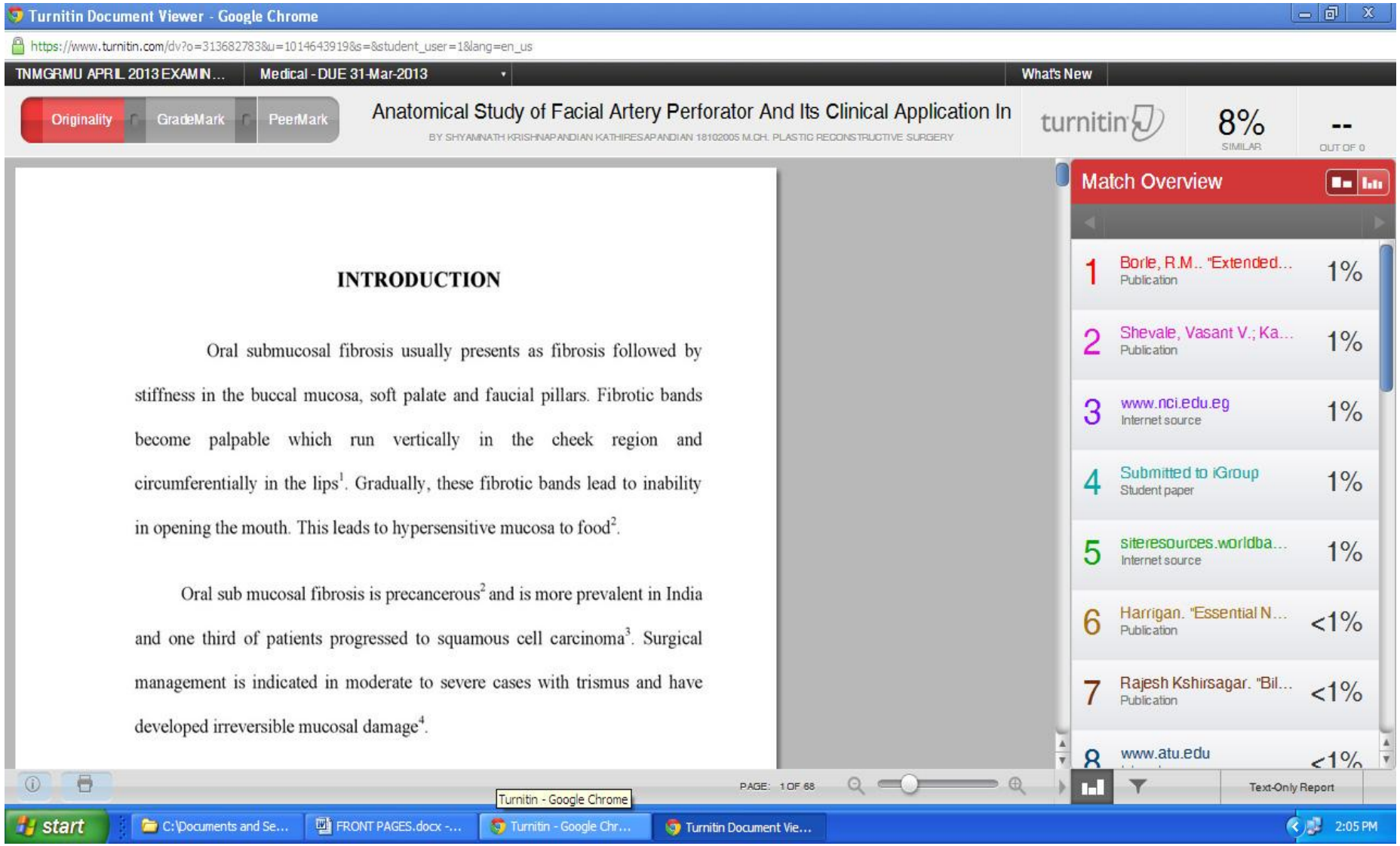
INTRODUCTION Oral submucosal fibrosis usually presents as fibrosis followed by stiffness in the buccal mucosa, soft palate and faucial pillars. Fibrotic bands become palpable which run vertically in the cheek region and circumferentially in the lips1. Gradually, these fibrotic bands lead to inability in opening the mouth. This leads to hypersensitive mucosa to food2. Oral sub mucosal fibrosis is precancerous2 and is more prevalent in India and one third of patients progressed to squamous cell carcinoma3. Surgical management is indicated in moderate to severe cases with trismus and have developed irreversible mucosal damage4. Resection of tumours in the cheek areas will have functional as...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INTRODUCTION
Oral submucosal fibrosis usually presents as fibrosis followed by stiffness in the buccal mucosa, soft palate and faucial pillars. Fibrotic bands become palpable which run vertically in the cheek region and circumferentially in the lips[1]. Gradually, these fibrotic bands lead to inability in opening the mouth. This leads to hypersensitive mucosa to food[2].
Oral sub mucosal fibrosis is precancerous[2] and is more prevalent in India and one third of patients progressed to squamous cell carcinoma[3]. Surgical management is indicated in moderate to severe cases with trismus and have developed irreversible mucosal damage[4].
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